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Fundamental OF Public Economics

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CHAPTER 1

Introduction

1.1 Public Economics

Public economics (or economics of the public sector) is the study of government policy through the lens of economic efficiency and equity. At its most basic level, public economics provides a framework for thinking about whether or not the government should participate in economics markets and to what extent its role should be. In order to do so, microeconomic theory is utilized to assess whether the private market is likely to provide efficient outcomes in the absence of governmental interference. Inherently, this study involves the analysis of government taxation and expenditures. This subject encompasses a host of topics including market failures, externalities, and the creation and implementation of government policy. Public economics builds on the theory of welfare economics and is ultimately used as a tool to improve social welfare.

In the broadest interpretation, public economics is the study of economic policy, with particular emphasis upon taxation. The subject therefore encompasses topics as diverse as responses to market failure due to the existence of externalities and the determination of optimal social security policies. This characterization reflects an extension of the scope of public economics from its initial emphasis upon the collection and disbursement of government revenues to its present concern with all aspects of government economic intervention. The intention of this book is to provide an introduction to the vast literature of public economics, emphasizing the foundations upon which future research can be laid.

Public economics has a long history as a discipline within economics and many eminent economists have written on the subject. For example, Ricardo (1817) discussed the effects of public debt, the incidence of taxation in imperfectly competitive markets was analyzed by Cournot (1838), Edgeworth (1925) considered the effects of taxation on multi-product firms and Pareto (1909) set out the foundations for making social decisions. The explanation for this interest in public economics is no doubt contained in the close connection of the analysis with policy and application, which are the ultimate inspiration of most economists. Exposing a theoretical construction to policy analysis also highlights its value and provides a test of its

relevance. However, it is also true that before a good policy can be designed an adequate theory must be developed. One of the challenges of public economics is that much of the subject area is still in its infancy with considerable work still to be done.

An emerging trend in the public economics literature has been the use of numerical methods. These have taken the form of both simulations of economies in order to test their behavior and the evaluation of policy proposals using empirical data. The latter technique indicates a promising convergence between theory and application and is clearly a direction in which the subject will continue to move.

The dominant setting for the analysis of public economics is within the mixed economy so that individual decisions are respected but the government intervenes to affect these choices. The design of policy can then be interpreted as the manipulation of individual choices by the choice of policy parameters so as to arrive at an equilibrium preferred to that which would arise in the absence of policy. This makes the results of the studies applicable to most developed economies and concurs with the present ascendancy of such a form of economic organization. To provide a benchmark from which to judge the outcome of the economy under alternative policies the perfectly controlled command economy with an omniscient planner is often employed. Naturally, this usage of the command economy implies no claim that such perfect control is possible, or even desirable.

1.2 Public sector income and expenditure

The public sector plays an important role in the mixed economies of the major industrialized countries. To show quite how important, this section presents some summary statistics concerning the size and structure of the public sector. Whilst there are some well-recognized issues concerning the appropriate definition of the public sector, these do not affect the validity of the broad sketch given here.

Table 1.1 shows the pattern of public sector total outlay as a percentage of nominal GNP over the period 1978 - 1993 for seven of the major industrialized countries from North America, Europe

and Asia. For these countries, public sector expenditure falls in the range of 30 - 55% of GNP with Japan and the United States having the smallest public sectors and Italy and France the largest. Even though the range is large, the public sector is significant in every case. Expenditure in Italy shows sustained growth through the period, as it does in the U.S. but to a lesser extent. Other than these countries, the pattern is generally one of the public sector being a constant proportion of GNP. This relative stability over the recent past is in sharp contrast to the period of expansion of the public sector experienced by the industrialized countries from 1890 through to 1970.

The major implication of Table 1.1 is that it clearly justifies the claim that the public sector is significant in the economies of the industrialized countries and the mixed economies of these countries are characterized by substantial government involvement. They are far from being free-market with minimal government intervention. The size of the public sector alone is justification for the study of how it should best choose its means of revenue collection and its allocation of expenditure. It is also worth noting that data on expenditure typically understates the full influence of the public sector upon the economy. For instance, regulations such as employment laws or safety standards infringe upon economic activity but without generating any measurable government expenditure or income.

Table 1.2 shows the proportion of Japanese government income derived from various sources and the division of its expenditure. The chart for income shows that direct taxation is the largest single component. Social security contributions and indirect taxation are the next largest and make fairly similar contributions to income. In terms of expenditure, social security spending is the largest category followed by purchases of goods and services. Interest on public debt is also a significant item of expenditure.

A similar breakdown of income and expenditure is reported for the United Kingdom in Table 1.3. Contrasted to Japan, the U.K. shows greater reliance upon indirect taxation, with indirect taxation generating slightly more revenue than direct taxation. The relative size of social security contributions is also much less than in Japan. The relative sizes of the expenditure items are very

similar, although the U.K. spends more on goods and services but less on subsidies. The social security item in Japan is equivalent in relative size to the transfers in the U.K.

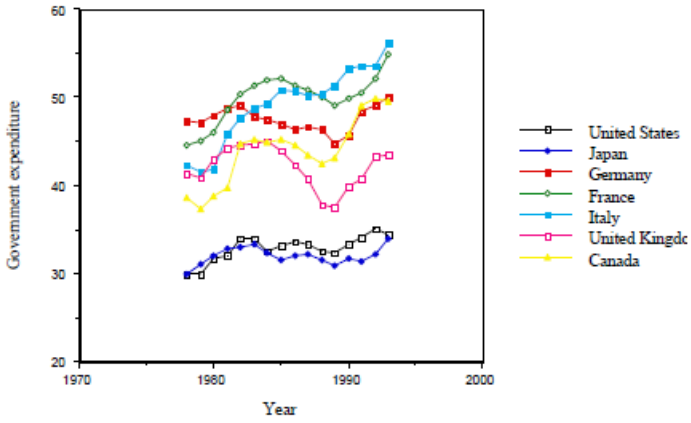

Figure 1.1: General government total outlay as % of nominal GDP

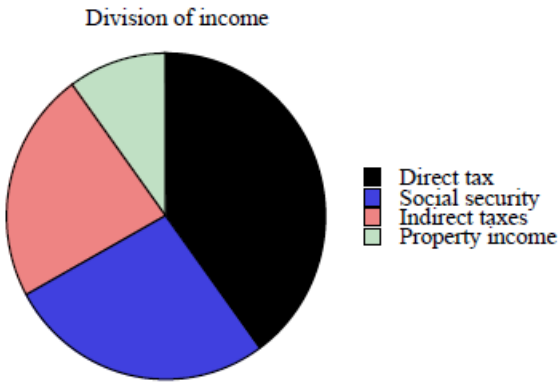

Figure 1.2: Japanese Government Income 1991

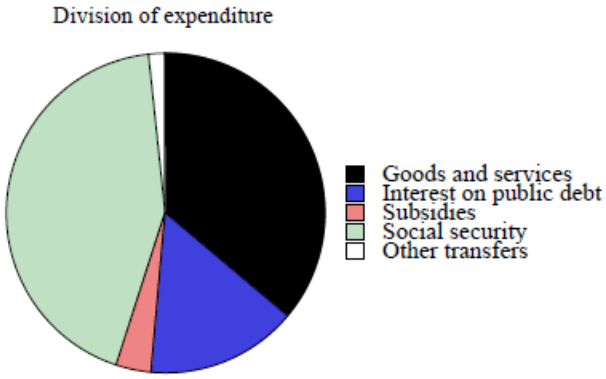

Figure 1.3: Japanese Government Expenditure 1991

Tables 1.2 and 1.3 demonstrate the importance of direct and indirect taxation in the collection of revenue for the U.K. and for Japan. Taken together, these generate 73% of revenue in the U.K. and 63% in Japan. The third item of income, social security contributions, is 17% of income in the U.K. and 27% in Japan. An alternative perspective on the relative importance of the three major categories of income is given in Table 1.4. This shows receipts as a percentage of GDP for the U.S. and as an average for other OECD countries. For the U.S., consumption taxes are relatively less important than as shown for Japan and the U.K. above and as against the average over OECD countries. However, consumption tax receipts still equal over 4% of U.S. GDP. Social security taxes raise twice the income of consumption taxes whilst income tax receipts represent one tenth of GDP. In contrast, the OECD average shows rather more equality between receipts from income and consumption taxes.

Table 1.5 shows the expenditure of the U.S. Federal Government broken down into type and function, expressed as a percentage of total expenditure. Similarly, Table 1.5b has the same breakdown for State and Local Government. These tables reveal that the major items of expenditure for Federal Government are income support and social security, and defence. In contrast, the major item for State and Local Government is education followed by income support and social security. Other than these, the most significant items are the net interest paid

by the Federal Government and transportation and civilian safety paid for by State and Local Government. The items can be placed into separate categories representing the breakdown of public sector objectives: defence expenditure is one of the minimal requirements; income support is evidence of concern for equity; and education represents provision of a public good to counter market failure.

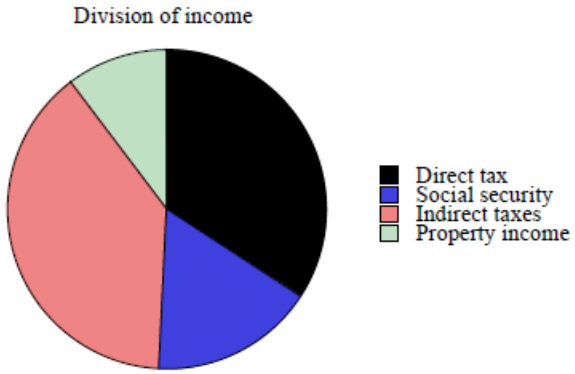

Figure 1.4: UK Government Income

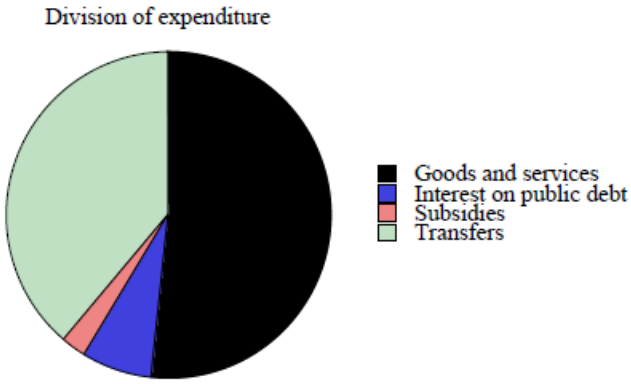

Figure 1.5: UK Government Expenditure

Summary

Although brief, this review of statistics on the size and structure of public sector income and expenditure has illustrated the significant extent of public sector intervention in the mixed economies of the industrialized countries. The relative importance of alternative sources of revenue has been shown as has the range of expenditure.

The earlier contributions were primarily concerned with the use of data to calculate losses for actual economies (Harberger for the USA, Cowling and Mueller for the UK and USA) but more recent work has concentrated on the use of simulations to calculate potential losses (Bergson (1973), Kay (1983)). Dickson and Yu (1989) employs a mix of both data and simulation. With respect to the form of model, the vast majority of contributions have adopted a partial equilibrium framework. There are some exceptions to this, most notably Ireland (1978), Kay (1983) and Myles (1994a).

The initial study of monopoly welfare loss is usually attributed to Harberger (1954) who considered the effect of monopolisation in United States manufacturing industry for the period 1924 to 1928. From the data it is concluded that welfare loss is equal to 0.08% of national income. Clearly if this figure is accurate, then monopoly welfare loss was insignificant in the United States. In contrast to Harberger, Cowling and Mueller (1978) include the cost of advertising in the measure of welfare loss on the interpretation that advertising is undertaken with the intention of maintaining a monopoly position. This naturally raises their estimates. Their analysis of welfare loss in the United States is based on data for 734 firms between 1963 and 1966 and concludes that welfare loss is between 4% and 13% of Gross Corporate Product. For the United Kingdom, Cowling and Mueller conclude that the top 103 firms in 1968 to 1969, accounting for a third of GNP, generated a welfare loss of between 3.9% and 7.2% of Gross Corporate Product. This contrasts with the loss of 0.2% to 3% using the Harberger measure for the same data set. These two sets of figures clearly provide conflicting evidence, as do the numerous other contributions that are surveyed in Sawyer (1981). The actual extent of welfare loss therefore remains an open question.

Turning now to measures of welfare loss in simulation models, these have generated far higher figures than analyses of data. Using a constant elasticity of substitution utility function, Bergson (1973) produces a range of estimates from 0.06% of national income to 39.03% The drawback to these figures is that they are calculated on the basis of hypothesized price-cost mark-ups rather than having the mark-up determined as the equilibrium of a specified economy. Kay (1983) employs a model with one consumption good that is produced by a monopolist using a single form of labor service.

CHAPTER 2
Commodity Taxation

2.1 Introduction

This chapter is the first to consider policy analysis and to arrive at characterizations of optimal policies. The ideas that it surveys have developed over a considerable period, beginning with the seminal contribution of Ramsey (1927). One important feature of this development is the gradual increase in generality and the recent move towards applying the theoretical analysis to data. This has moved the theory closer to practical application.

The initial literature on commodity taxation focused upon the following simple problem. There is a given level of government revenue to be raised which must be financed solely by taxes upon commodities: how should these taxes be set so as to minimize the cost to society of raising the required revenue? If a social welfare function is adopted to represent the state's preferences, the problem can be conveniently rephrased as that of choosing the commodity tax rates to maximize social welfare subject to the revenue constraint.

The first solution to this problem was given by Ramsey (1927) following its proposal to him by Pigou. This contribution appears to have been overlooked for the following forty years during which time the less general inverse elasticities rule became a standard feature of textbooks. The results of Ramsey were rediscovered by Samuelson (1986) in a 1951 memo to the U.S. Treasury. The theory of commodity taxation was given its modern form by Diamond and Mirrlees (1971) in an analysis that made much use of the emerging duality methods and results in general equilibrium theory. Diamond and Mirrlees (1971) derived both single-household and many-household tax rules and proved the Production Efficiency Lemma. Developments since the publication of Diamond and Mirrlees have been concerned with the practical implementation of the methods of that paper and in extensions of the basic economy away from the standard competitive framework with constant returns to scale.

It should be noted that there are close connections between the theory of commodity taxation and that of public sector pricing. In both cases the government is choosing the set of consumer prices that maximize welfare subject to a constraint. Under the commodity taxation interpretation these prices are achieved by setting the level of tax to be included in each consumer price whereas with public sector pricing the prices are chosen directly. However the choice of tax rate is equivalent to the choice of consumer price. In the context of public sector pricing, the optimal prices are generally known as Ramsey prices. The constraint on the optimisation with commodity taxation requires the raising of a specified level of revenue. With public sector pricing this can be reinterpreted as the need to raise a given level of revenue in excess of marginal cost. The tax rates of the commodity taxation problem then translate into the mark-up over marginal cost in the public sector pricing interpretation.

The chapter begins by deriving the single-household Ramsey rule and providing an interpretation of this. It is then shown how the inverse elasticity rule follows as a special case. The extension to many consumers is made and the resolution of the equity/efficiency trade-off is emphasised. This is followed by a review of numerical calculations of optimal taxes based on empirical data. Three more specialised topics are then considered: generalising the production technology; the status of untaxed goods; and conditions guaranteeing the uniformity of taxes. A discussion of the Diamond-Mirrlees Production Efficiency lemma concludes the chapter.

2.2 The Ramsey rule

The Ramsey rule is one of the oldest results in the theory of optimal taxation and is probably the oldest formally stated result. It is derived from an analysis of the simplest form of general equilibrium economy, that with a single household. The single household basis implies that there can be no equity considerations in the setting of tax rates so that the resulting tax rule describes an efficient tax system. As the Ramsey rule forms the basis for later results, its derivation is described in some detail.

2.2.1 The economy

The Ramsey rule is derived within the context of a competitive economy in which there are available n consumption goods and a single form of labour. Labour is the only input into production. In addition, each industry is assumed to produce a single output using constant returns to scale technology. There is a single household or, equivalently, a population of identical households, whose preferences can be represented by an indirect utility function.

2.3 Implications

The Ramsey rule only provides an implicit expression for the optimal tax rates and precise statements cannot be made without further restrictions. However, some general comments can be made. Accepting the approximation interpretation, this suggests that since the proportional reduction in compensated demand must be the same for all goods it can be expected that goods whose demand is unresponsive to price changes will bear higher taxes. Although broadly correct, this statement can only be truly justified when all cross-price effects are accounted for. One simple case that overcomes this difficulty is that in which there are no cross-price effects between the taxed goods; this limiting case will be considered in the next section.

Returning to the general case, goods that are unresponsive to price changes are typically necessities such as food and housing. Consequently, the implementation of a tax system based on the Ramsey rule would lead to taxes that would bear most heavily on necessities, with the lowest tax rates on luxuries. This interpretation has been demonstrated more formally by Deaton (1981) under the assumption of weak separability of preferences. Put into practice, this structure of taxation would involve low income households paying disproportionately larger fractions of their incomes in taxes. The inequitable nature of this outcome is simply a reflection of the single household assumption: the objective function of the maximisation does not care about equity and the solution reflects only efficiency criteria.

The equilibrium determined by the set of optimal taxes is second-best compared to the outcome that would arise if the tax revenue had been collected via a lump-sum tax. This is because the commodity taxes lead to substitution effects which distort the household’s optimal choices and

lead to efficiency losses. Although unavoidable when commodity taxes are employed, these losses are minimised by the optimal set of taxes that satisfy the Ramsey rule.

Since the single-household framework is untenable as a description of reality and leads to an outcome that would be unacceptable on the most minimal of equity criteria, the value of the Ramsey rule is therefore primarily in providing a framework and a method of analysis that can easily be generalised to more relevant settings. Contrasting the Ramsey rule tax system with later results will also highlight the consequences of the introduction of equity considerations.

2.4 Inverse elasticities rule

The inverse elasticities rule, discussed in detail in Baumol and Bradford (1970), is derived by placing further restrictions on the economy used to derive the Ramsey rule. To be precise, it is assumed that there are no cross-price effects between the taxed goods so that the demand for each good is dependent only upon its own price and the wage rate. Invoking this assumption essentially turns the general equilibrium model into one of partial equilibrium as it removes all the interactions in demand and, as shown by Atkinson and Stiglitz (1980), the inverse elasticities rule can be derived from minimising the excess burden of taxation in a partial equilibrium framework. The independence of demands is clearly a strong assumption and it is therefore not surprising that a clear result can be derived.

2.5 Extension to many-households

The objective of this section is to extend the single-household economy of the Ramsey rule to incorporate further, non-identical, households. This extension naturally introduces equity considerations into the determination of the optimal tax rates. The principal paper in this area is Diamond and Mirrlees (1971) in which was presented the first integrated analysis of this issue. Other important references are Diamond (1975) and Mirrlees (1975).

The variant of the Diamond-Mirrlees economy studied in this section is a restriction of the general case and simply involves extending that used to derive\ the Ramsey rule by adding

further households. The restrictions on the production technology are retained, so that labour remains the only input into production and technology is constant returns to scale. It is worth noting that the restrictions do not significantly affect the form of the optimal tax structure.

2.5.1 A cautionary note

To this point the analysis has proceeded on the implicit assumption that the first-order condition for the maximisations is accurately characterize the solution. However this need not always be the case. It is a standard result that an indirect utility function representing convex preferences will be quasi-convex in prices. That is, the set of prices that leads to less than a specified level of utility is a convex set. In addition, with linearity in labour supply the indirect utility function may even be strictly convex, see Varian (1984). This poses difficulties for many maximisations in public economics.

For the Ramsey rule, the objective function was the household's indirect utility function and hence was quasi-convex. In the many-household economy, the objective was some concave function of the vector of indirect utility functions. Despite the concavity of social welfare in utility it need not be concave in the choice variables, the tax rates and due again to the quasi-convexity of indirect utilities. In addition, the set of tax rates that generate at least the required revenue may not be a convex set.

For these reasons the standard sufficiency conditions of quasi-concave programming cannot be appealed too so there is no guarantee that the first-order conditions actually describe a maximum. This problem occurs throughout public economics where many maximisations are ill-conditioned and has been explored extensively by Mirrlees (1986). This problem is often put to one side and it is simply assumed that the first-order conditions will correctly describe the optima. Although unsatisfactory, there is typically little alternative to this. Some comfort can be taken in the present circumstances by appealing to the work of Diamond and Mirrlees (1971) who prove that their first-order conditions do represent the solution to the optimal commodity tax problem.

2.6 Untaxed goods

The role of normalisation procedures and of the untaxed good was discussed at some length in the previous section. The importance of applying normalizations correctly has been emphasised in the literature on optimal commodity taxation by the number of cases in which they have been misunderstood. This section notes the misunderstandings that have arisen and illustrate their origins.

It has been shown that in an economy with constant returns to scale, consumer and producer prices can be normalised separately and that the standard procedure is to make one good the numeraire and set its consumer and producer prices equal. This normalisation also has the effect of setting the tax on that good to zero. The latter fact is clearly seen to be of no consequence whatsoever since the zero tax is just a result of the normalisation rule. In particular, the zero tax carries no implications about the nature of the good nor about the ability to tax that good. This follows since the good with zero tax can be chosen arbitrarily from the set of available goods.

Unfortunately, this reasoning has not been as clearly appreciated in some of the literature as it should have been. The reason for this has been the convention, as the untaxed commodity. Since labour is often viewed as the negative of leisure, it has been inferred from this that, since leisure cannot be measured in the same way that purchases of other commodities can, the zero tax on leisure is a restriction on the permissible tax system brought about by an inability to tax leisure. In addition, the further inference is usually made that the optimal tax system aims to overcome the missing tax on leisure by taxing goods complementary to leisure. Particular examples of this are found in Corlett and Hague (1953) “By taxing those goods complementary with leisure, one is to some extent taxing leisure itself “and Layard and Walters (1978) “The theory of second best tells us that it we cannot tax leisure, we can do better than by taxing all other goods equi proportionately. “ Many other instances of similar statements could easily be given. This, of course, is a false interpretation. When real restrictions upon the permissible range of tax instruments are introduced the results obtained are affected. A number of such restrictions are considered in Munk (1980) where it is shown that the resulting optimal tax structure is sensitive to the precise restrictions imposed”.

A further mistake that has arisen in this context can be found in Dixit (1970) and Lerner (1970). In a single-household economy, any required revenue can be raised most efficiently by a lump-sum tax on the household equal to the value of the revenue. Noticing this, it has been suggested that a set of commodity taxes which raise the price of all goods by the same proportion will have the same effect as the lump-sum tax and therefore that when all goods can be taxed, the optimal system has the same proportional tax on all goods. This conclusion is clearly in contrast to that of the Ramsey rule. The mistake in the reasoning was pointed out by Sandmo (1974) who demonstrated that such a proportional tax system would raise no revenue. This follows since households both demand goods and supply labour. A proportional tax then taxes demands but subsidises supplies and, since the value of household demand equals the value of supply, the proportional tax is just offset by the proportional subsidy. Effectively, the proportional tax on all commodities is just a rescaling of the consumer price vector which does not affect household choices.

2.6 Uniform taxes

The numerical results reported in Section 5 have demonstrated that in general the structure of optimal commodity taxes will be far from uniform. However, uniform taxes are not without their supporters, see for example Hatta (1986), and it is natural to consider whether there are any circumstances in which the optimal structure should be uniform.

Conditions guaranteeing uniformity have been derived in papers by Deaton (1979, 1981) and Besley and Jewitt (1990). These papers have used a variety of representations of preferences in alternative formulations of the optimal tax problem. To present the central result in the manner closest to the analysis above, this section will present the problem in terms of ad valorem taxation with an indirect utility function capturing preferences.

2.7 Production efficiency

Production efficiency occurs when an economy is maximising the output attainable from its given set of resources. This requires the economy to be on the boundary of its production possibility set. When such a point is attained, reallocation of inputs amongst firms cannot increase the output of one good without reducing that of another. In the special case in which each firm employs some of all of the available inputs, a necessary condition for production efficiency is that the marginal rate of substitution (MRS) between any two inputs is the same for all firms. Such a position of equality is attained, in the absence of taxation, by the profit maximisation of firms in competitive markets. Each firm sets the marginal rate of substitution equal to the ratio of factor prices and, since factor prices are the same for all firms, this induces the necessary equality in the MRSs. The same is true when there is taxation provided all firms face the same post-tax prices for inputs, that is, inputs taxes are not differentiated between firms.

In the context of commodity taxation, Diamond and Mirrlees (1971) proved the Production Efficiency Lemma. Assuming the economy is competitive, the lemma states that the equilibrium with optimal commodity taxation should be on the frontier of the aggregate production set. This can only be achieved if private and public producer face the same shadow prices and if input taxes are not differentiated between firms. In addition, since the competitive assumption implies that any set of chosen post-tax prices can be sustained by the use of taxes on final goods alone, the latter statement also carries the implication that intermediate goods should not be taxed.

This result was seen as surprising at its time of publication because it was clearly in sharp contrast to the predictions of the Lipsey-Lancaster (1956) Second-Best theory that was being widely applied. Application of Second-Best theory, which typically suggests that one distortion should be offset by others, would imply that the distortion induced by the commodity taxes should be matched by a similar distortion in input prices. Commodity taxation is therefore a special case for which the general reasoning requires careful application.

The efficiency lemma, and the structure of the optimal commodity tax problem, can easily be explained diagrammatically for a single household two-good economy. In Figure 2.1 the horizontal axis measures input use and the vertical axis output. The shaded area is the production set for the economy and the horizontal distance of the production set from the origin represents

the tax revenue required in units of the input good. It is assumed that the household supplies the input and consumes the output, so that the supply of more input from the household permits the purchase of more output. The household's budget constraint is therefore upward sloping and, in the absence of lump-sum taxes or income, must pass through the origin. Denoting the optimal set of post-tax prices by q, the budget constraint corresponding to this price vector is illustrated.
Since supplying the input causes the household disutility, an increase in input supply must be compensated for by further consumption of output in order to keep utility constant. The household's indifference curves are therefore downward sloping.

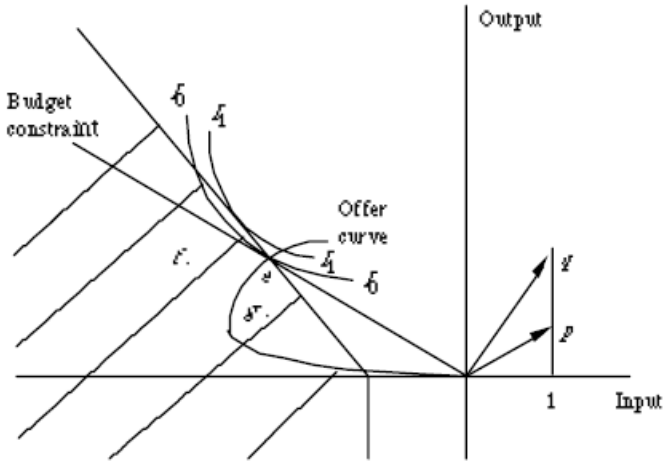

Figure 2.1: Production Efficiency

Although Figure 2.1 was motivated by considering the input to be labour, a slight re-interpretation can introduce intermediate goods. Assume that there is an industry that uses one unit of labour to produce one unit of an intermediate good and that the intermediate good is then used to produce final output. Figure 2.1 then depicts the intermediate good (the input) being used to produce the output. Although the household actually has preferences over labour and final output and acts only on the markets for these goods, the direct link between units of labour and of intermediate good allows preferences and the budget constraint to be depicted as if they were defined directly on those variables. The production efficiency argument then follows directly as

before and now implies that intermediate goods should not be taxed since this would violate the equalisation of MRSs between firms.

2.8 Summary

This chapter has reviewed the major contributions to the large literature on optimal commodity taxation in a competitive economy. The Ramsey rule, which represents the starting point for the modern analysis of commodity taxation, has been introduced and its standard interpretation has been given. Although efficient, the tax system the tax system this describes would be inherently inequitable. To introduce equity considerations, the economy was then extended to incorporate many households following the work of Diamond and Mirrlees. This extension clarified the effects of equity upon the optimal rates of tax and demonstrated how the equity/efficiency trade-off was resolved. The economy was then generalised further and the Diamond-Mirrlees Production Efficiency Lemma was proved. Contrary to the expectations of Second-Best theory, this lemma showed that production efficiency is desirable in conjunction with the optimal set of commodity taxes.

CHAPTER 3
Income Taxation

3.1 Introduction

The taxation of income is a major source of revenue in most developed countries. It is also one of the most contentious. From one point of view, an income tax is seen as a direct means of effecting redistribution in order to meet objectives of equity. From another, the imposition of an income tax is viewed as a major disincentive to effort and enterprise particularly when the marginal rate of tax increases with income. The theory of income taxation shows how these competing views influence the design of the optimal tax and how the competing trade-offs are resolved.

The analysis of income taxation that is undertaken below follows from the initial contribution of Mirrlees (1971). Prior to that, there had been no formal analysis of the structure or determinants of an income tax schedule that fully captured the efficiency/equity trade-off involved in income taxation. In addition, the Mirrlees analysis also embodied the fact that the truly relevant characteristics for taxation, the unobservable ability levels of the households, can only be inferred indirectly from observed behaviour. This implies that the structure of the income tax must be compatible with the revelation of this information by households.

3.2 The Mirrlees economy

The value of the Mirrlees' economy in the analysis of income taxation is due to the manner in which it captures the most important features of the tax design problem. These features are that the no-tax equilibrium of the economy must have an unequal distribution of income in order to introduce equity motivations for taxation. The income distribution must also be generated endogenously by the model, with households differing in the income they earn, and the income tax must affect the labour supply decisions of the households in order to introduce efficiency considerations. The economy must also be sufficiently flexible that no prior restrictions are

placed on the tax functions that may be solutions. The Mirrlees' specification is the simplest that satisfies all these requirements.

To simplify and focus the analysis, it is assumed that the economy is competitive and that households in the economy differ only in their levels of skill in employment. A household's level of skill determines their hourly wage and hence their income. The skill level is private information and is not known to the government. The only tax instrument of the state is an income tax. An income tax is employed both because lump-sum taxes are infeasible and because it is assumed that it is not possible for the state to observe separately hours worked and income per hour. Therefore, since only total income is observed, it has to be the basis for the tax system. The content of this restriction is best understood by considering the consequences of its relaxation. If it were relaxed, a tax could be levied that was based on income per hour; in many cases this would be a better guide to a household's potential earning power than actual income. Indeed, in the economy employed below, income per hour is precisely the ultimate target of taxation. Despite this, it does not seem unreasonable to assume that, as in practice, only total income is observed.

The income tax function is chosen to maximize social welfare subject to achieving the required level of revenue. The generality of the analysis, and the source of many of the difficulties involved in carrying it out, derives from the fact that no restrictions are placed at the outset on permissible candidates for the optimal tax function. It is intended by this that the economy determines the structure of the tax function rather than important aspects of the function being determined by a priori assumptions.

Taxes on labor income and consumption spending encourage households to shift away from work in the legal market sector and toward untaxed uses of time such as leisure, household production, and work in the shadow economy. In Tax Effects on Work Activity, Industry Mix and Shadow Economy Size: Evidence from Rich-Country Comparisons (NBER Working Paper No. 10509), authors Steven Davis and Magnus Henrekson assess the long-term effects of persistent tax rate differences among countries. The authors stress that taxes affect work activity directly through labor supply-and-demand channels and indirectly through government spending responses to available tax revenues. They find that higher tax rates on labor income and

consumption expenditures lead to less work time in the legal market sector, more time working in the household sector, a larger underground economy, and smaller shares of national output and employment in industries that rely heavily on low-wage, low -skill labor inputs.

The estimated tax effects are large for the authors' preferred tax measures. Cross-country comparisons in the mid-1990s indicate that a tax hike of 12.8 percentage points (one standard deviation) leads to 122 fewer hours of market work per adult per year and a 4.9 percentage point drop in the employment-to-population ratio. It also increases the size of the shadow economy by 3.8 percent of official GDP, and it reduces by 10 to 30 percent the share of national output and employment in "Retail Trade and Repairs," in "Eating, Drinking, and Lodging," and in a broader category that includes "Wholesale Trade and Motor Trade and Repair." The evidence suggests that tax rate differences among rich countries are a major reason for large international differences in market work time and in the industry mix of market activity.

The authors' broad-brush international comparisons are useful for several reasons. First, the focus on national outcomes provides information about the impact of taxes through their effects on the composition of labor demand. Because home production is highly substitutable for many market goods and services produced by less skilled workers, taxes on labor and consumption twist labor demand away from less skilled workers, amplifying their negative effects on aggregate employment.

Second, countries with high tax rates on labor income and consumption expenditures have relatively generous tax-funded programs for social security, disability insurance, sick leave assistance, unemployment insurance, and general assistance. The benefit sides of these programs also alter labor supply incentives in ways that discourage market work activity and increase employment in the underground economy. To the extent that government spending on these programs responds to the availability of tax revenues, the full response to differences in taxing capacity must take into account the indirect effects that show up through the expenditure side of government behavior. Conceivably, the indirect expenditure effects are larger than the direct effects of taxes.

Third, there are large, highly persistent differences among countries in tax rates on labor and consumption and in the scale of tax-funded social insurance programs. The persistent character of national differences in tax rates makes them well suited to assessing long-term effects.

3.3 The optimisation

The optimal income tax function is chosen to maximize social welfare. This maximisation is subject to two constraints. The first constraint is that the income tax function must lead to an outcome that satisfies productive feasibility or, equivalently, meets the governments revenue requirement. The second constraint that must be satisfied is rather more complex and the way in which it is handled is of central importance for the analysis. To best understand the nature of this constraint, an alternative interpretation of the optimisation is helpful. Rather than viewing the government as choosing an income tax function, it can be seen as assigning to each household a pre-tax income - consumption pair.

The additional constraint is then that each household must find it in their own interest to choose the pre-tax income - consumption pair that the government intends for them rather than a pair assigned to a different household. In other words, the intended pair be must utility-maximising for the household over the set of available pairs. Due to its nature, this is termed the self-selection constraint. It is worthwhile noting at this point some of the difficulties involved in the analysis of the general problem. The tax function is not restricted in form so that for most tax functions the budget constraints of the households will be nonlinear. In those cases for which the budget set is non-convex, there may be non-uniqueness in the solution to the individual households' maximisations and the solutions need not form a convex set. These facts prevent the behaviour of the individuals being expressible by demand functions, and therefore introduce considerable mathematical complication. It is also the reason why the self-selection constraint must be made explicit in the analysis of income taxation but not in that of commodity taxation. Mirrlees (1986) provides a thorough discussion of these issues.

3.4 Characterisation of optimal tax function

The aim of the theoretical analysis is to provide a characterisation of the properties that the optimal tax function will have, given the specification and assumptions adopted. It will clearly not be possible to calculate the function without precisely stating the functional forms of utility, production and skill distribution. What will be achieved is the derivation of a set of restrictions that the optimal function must satisfy. This is undertaken firstly for the case where the marginal rate of tax is assumed constant. As already noted this implies convexity of the individual budget set and allows behaviour to be expressible via demand functions which considerably simplifies the resulting analysis. The general problem is then considered. Results are derived using both the necessary conditions for the maximisation of social welfare and directly using a diagrammatic framework.

3.5 Linear taxation

The complexity of the general model of income taxation has lead to considerable interest in the restricted case of linear taxation. With linear taxation the marginal rate of tax is constant and there is an identical lump-sum tax or subsidy for all households. The advantages of this restriction is that it ensures that the budget sets of all households are convex so that optimal choices will be unique when preferences are strictly convex. In addition, the tax system is described by just two parameters: the marginal tax rate and the lump-sum subsidy. The choice of optimal policy therefore corresponds to a standard maximisation problem. In addition, the linear tax structure corresponds to proposals for negative income tax schemes, in which all households below a given income level receive a subsidy from the tax system, and to the tax reform proposals of a number of countries that have reduced the number of tax rate bands.

Many people who buy mutual funds and other stocks often end up paying tax twice when they finally sell the security. This is because they do not keep track of their "average cost base" per share. This problem is very prevalent on investments when the dividends have been reinvested in the same security. Most mutual fund investors reinvest their dividends in more shares of the same fund. Many large corporations offer dividend reinvestment programmes that allow the shareholder to acquire more shares of the corporation directly without any brokerage charges.

While reinvestment of dividends is usually an excellent idea, it does require some record keeping on your part to avoid double taxation. Many financial planning firms provide this tracking as part of their service. In my experience almost every case that I have looked at after a sale, has resulted in the reinvestment of dividends not being accounted for.

For example, let's say you bought units or shares in XYZ mutual fund in 1990 for $ 10,000 when the shares were $5 each. So you got 2000 shares. At the end of the year, the fund will declare a dividend equal to the total of its realized capital gains, dividend and interest income etc. less the fund's expenses. Let's say this dividend worked out to 30 cents per share. On 2000 shares that is a $600 dividend or 120 more shares if the unit value hasn't changed since you bought into the fund.

You will receive a T3 slip in March for that dividend whether you take cash or additional shares for it. If it is a mutual fund corporation you will receive a T5 slip for the dividend declared at its fiscal year end. The tax effect is the same. The point to understand here is that you will be paying taxes that year on that dividend whether you receive it or not. If you reinvest the dividend in more of the same shares, for tax purposes the "average cost per share" has now risen by 30 cents per share. Your total investment is now $10,600 (2120*5.00) from an income tax point of view because you will already have been taxed in the current year for the $600.

Now let’s assume they pay the same dividend on the same unit value in 1991, 1992, 1993 and then you sell your shares in XYZ mutual in 1994 and receive net proceeds of $14,000. Most people I have found would report a capital gain of $4,000 on their tax return and forget that they already paid tax on four annual dividends. The capital gain is actually $1,600 ($14,000 - $10,000 + 4 x $600), less than half of what is often reported. The good news is that if this has happened to you, you can apply to have an adjustment for at least the last three years of tax returns and sometimes further back than that.

As you may sell a portion of your shares instead of the entire position, it is necessary to keep track of these matters on a price per share basis, rather than the total investment. By adding the dividend per share to the previous cost per share, you now have the new cost per share for future

redemptions. This calculation is especially helpful if you are taking a regular monthly income from a mutual fund-often referred to as systematic withdrawal plans. As there are often twelve redemptions per year, a simple record is necessary to come up with the taxable portion for tax time.

If you do not keep track of your cost per share you will be paying more tax than necessary. If you have other losses to offset your gains, you will be using up your losses needlessly. All of these are forms of double taxation, which result from not keeping track of reinvested dividends.

3.6 Extensions and omissions

The basic Mirrlees economy described above has been extended in a number of directions and two of these are now considered. The first extension introduces a second form of labour service which allows the income tax to have indirect distributional effects via the changes in relative wages. Following this, the nonlinear income tax is combined with linear taxes upon commodities and conditions are found for which commodity taxes are unnecessary. The section is completed by noting some relevant issues that are not addressed in the formal analysis.

Two forms of labour

The relevance of introducing a second form of labour service is that the economy can be designed so that the population is partitioned with those of low skill supplying a form of labour with a low wage and those of high skill supplying labour with a higher return. To obtain such a partition it is only necessary to assume that there are two distinct levels of skill: high and low. The new factor introduced by the existence of two wage levels is that the income tax can alter the relative values of these wages and, in doing so, alters the distribution of income between the two skill groups. This second route for redistribution will clearly be important in the determination of the optimal income tax.

In the first analysis of a model of this form Feldstein (1973) employed numerical techniques to investigate the effect of the relative wage variation upon the value of the optimal linear income

tax. With the two forms of labour entering into a Cobb-Douglas production function, Feldstein concluded that there was little difference between the optimal tax with fixed wages and that with variable wages.

The conclusion of Feldstein was reconsidered in Allen (1982) employing an analytical, rather than a numerical, approach. The significant extension made by Allen was to use a more general form of production technology. This demonstrated that in the Cobb-Douglas case the redistribution via the income tax was reinforced by the adjustment of relative wages thus explaining the Feldstein (1973) results. However, if the elasticity of substitution between the two forms of labour is low and the labour service earning the higher wage has negative supply elasticity, then the relative wage effect operates in the opposite direction of the income tax effect and may outweigh it. When the indirect effect does outweigh the direct effect, the optimal policy becomes a combination of lump-sum tax and a negative marginal rate of income tax.

These results indicate that the analysis of income taxation becomes rather more difficult and can generate surprising conclusions when more than one form of labour service is introduced into the model. This assumption of the standard economy may therefore be more restrictive than it at first appears.

3.7 Omissions

The economy that has been studied was, by necessity, highly stylised. Although this brings undoubted analytical benefits, it does eliminate from consideration many issues that are of practical interest. Some of these are now briefly discussed.

The economy involved only a single form of labour service but with differences in the ability of households to perform this service. In reality, there are many different forms of labour in an economy which differ in the skills they require and in the working conditions they impose. The actual monetary payment for the supply of labour may only be part of the package of remuneration, and some of the return (or cost) may be entirely psychic in nature. A income tax policy designed to maximize welfare would need to take account of the entire package of

characteristics that constitutes labour supply. The labour supply decision also involves more than simply the determination of the number of hours to work. As occupations differ in their characteristics, the choice between occupations is important and this choice will be affected by income taxation.

For instance, an increase in taxation will be detrimental to occupations where the return is predominantly monetary. There are also intertemporal aspects to the labour supply decision such as the timing of entry to the labour force and the timing of retirement. As an income tax will introduce a distortion into such decisions, this increases the potential efficiency loss. Some of these issues are addressed in Christiansen (1988).

The preferences of the households have been taken as identical. This need not be the case and differences in preferences may arise. Furthermore, the household has been viewed as supplying an homogeneous form of labour but in practice the total labour supply is often the sum of male and female components. The nature of these is often very different and empirical evidence suggests that they have markedly different responses to taxation. This observation implies that the analysis should be based upon greater detail of the structure of households. Furthermore, it also raises issues concerning the tax treatment of the individuals that constitute the household such as whether they have the option or not of being tax as separate individuals or whether a joint household return is compulsory.

3.8 Summary

This chapter has reviewed the formal analysis of the optimal income tax problem. The problem has been treated as one of choosing the income tax function to balance equity and efficiency considerations in an economy characterised by inequality in the distribution of income. The standard economy of Mirrlees (1971) has been described and it has been noted that this is the simplest for which the income tax problem has any real content. The major theoretical results have been derived and, although they do not provide a precise characterisation of the optimal tax

schedule, they do suggest its most important properties, some of which are in conflict with the structure of observed tax schedules. Numerical analyses have been used to further investigate the nature of the tax schedule and its dependence upon the assumed structure of the problem.
Results from some of the most noteworthy of these analyses have been given above. In particular they demonstrate that the marginal rates of tax may be rather low but do increase with concern for equity. However, the conclusions are sensitive to the assumptions invoked by the model. The implications of the modification of some of these assumptions was considered.

The chapter was concluded by a consideration of two extensions. The introduction of a second form of labour service could lead to a marked change in the form of the optimal tax function if the indirect effect of taxation upon relative wages outweighed the direct effect. The optimal combination of income and commodity taxes was then considered and it was shown that weak separability of leisure would make commodity taxes redundant.

The methods of analysis can be adapted to treat other forms of nonlinear taxation. It needs only a minor revision to turn the income tax into an expenditure tax with a suitable re-interpretation of the skill variable as a preference parameter. Many of the theorems derived then apply directly to this new setting. In fact, several of the studies cited, such as Mirrlees (1976) and Seade
(1977) are concerned with general nonlinear taxes rather than income tax per se.

CHAPTER 4

Risk

4.1 Introduction

Risk is a factor that is evident throughout economic activity. Firms must choose between investment plans for which both the cost and the return cannot be known with certainty, households purchase goods whose value in use is determined by the state of nature and the government receives uncertain revenues and allocate funds to projects with unknown outcomes. Although the Arrow- Debreu economy is capable of incorporating risks of these kinds, so that they can be viewed as having already been covered by previous analysis, the special features involved with risk justify a separate chapter devoted to the subject. The interpretation of the Arrow-Debreu economy in the presence of risk is discussed first and the Pareto optimality of equilibrium is reconsidered with particular focus placed upon the number of markets necessary to sustain optimality.

This analysis is at the level of generality of previous chapters. The reasons why there may be too few markets to sustain optimality and whether this may justify government intervention are also considered. Individual attitudes to risk, in terms of measures of risk-aversion are then contrasted to social attitudes. Alternative perspectives on social attitudes, including the Arrow- Lind theorem supporting risk-neutrality of government, are contrasted. A more general framework is then presented which shows how social attitudes to risk can be derived from the social insurance effects of projects and the weighting of households in the social welfare function.

A more specific interpretation of risk in terms of assets with random returns is then adopted and household maximisation is analysed in further detail. Reactions to taxation are determined under various assumptions about the loss-offset provisions of the tax system, the return on the safe asset and the number of risky assets available. Two alternative perspectives on the nature of risk and the interaction with taxation are then described. The first is the standard utility maximisation analysis of labour supply but extended to include uncertainty about the wage. This is followed by a consideration of choice between occupations where one occupation has a known return and the other an uncertain pay-off.

Several different approaches to the design of the income taxation with risk are described. The first set of analyses considers risks which are purely individual: some households may do well and others badly. The unifying feature of these is shown to be the welfare gains that can be achieved by the use of a distorting income tax due to the social insurance that the tax can provide. The social insurance effect is such that it preferable to raise revenue from a set of ex ante identical households using the optimal income tax rather than a uniform lump-sum tax. These results are contrasted to those that apply under purely aggregate risk where the entire population either gains or loses. In the latter case, taxation cannot provide social insurance.

Before proceeding, two points are worth noting. In common with most recent literature, no distinction is made here between risk and uncertainty; the two terms are employed interchangeably. Although tax evasion is an example of choice with risk, it is somewhat special because of its illegality. In addition, the substantial literature on tax evasion merits separate consideration.

4.2 General equilibrium with risk

Risk can be incorporated into the Arrow-Debreu economy with very few formal modifications; effectively all that needs to be done is to increase the number of goods and prices in an appropriate manner. The classic presentations are given in Arrow (1963) and Debreu (1959). Radner (1985) provides an extensive survey of the relevant literature.

The major focus here will be placed on the simplest case in which all contracts are formed in period 0 and the uncertainty is about the state of the world that will occur in the only other period, period 1, in which contracts are fulfilled and consumption takes place. In this setting it is not necessary to distinguish commodities by their time of availability. The extension to many time periods (though retaining a single period in which contracts are formed) will be briefly discussed; none of the essential conclusions is modified.

In the risk evaluation phase, there are a number of key areas that must be covered. One of the most important is to understand probable threats. In an ideal world, which most of us have

noticed does not exist, we would identify and protect ourselves against all threats to ensure that our business continues to survive. Obviously, we are constrained by other factors such as budgets, time and priorities and need to apply cost benefit analysis to ensure we are protecting the most critical business functions.

A second important step is to identify all probable threats and prioritize them. Threats, typically, can be classified in several ways such as internal/external, man-made/natural, primary/secondary, accidental/intentional, controllable/not controllable, and warning/no warning, frequency, duration, speed of onset etc. While classifying threats is helpful in terms of understanding their characteristics and potential controls, grouping and understanding by business impact is also important. Obviously, the same impact can result from a number of different threats.

Identifying mission critical business processes and systems is another fundamental building block of the business continuity plan. After your critical business processes and systems and probable threats are established, the next step is to identify vulnerabilities and loss potential. This requires an extensive scan of the organization to identify vulnerabilities and then analysis to understand those vulnerabilities which would have the greatest impact on your critical business processes and the organization. This starts to clarify and quantify potential losses, which helps to establish priorities.

Following the identification of the most probable threats and vulnerabilities, an analysis of existing controls is needed. This spans physical security as well as people, processes, data, communications and asset protection. Some controls such as physical security and data backup are obvious. Other controls required are often less obvious, but they can be identified through the risk evaluation process.

Once the key building blocks of critical business functions, most probable threats, vulnerabilities and controls are identified, the next stage is to develop an understanding of the probability of threats factored by the severity or impact of the threats. This leads to the business impact analysis phase which establishes priorities for protection.

The goal is to minimize threats, impacts and downtime and to mitigate any losses. Fundamentally, the goal is to protect your people, protect your data, protect your vital communications and protect your assets and to protect your brand and reputation. Overall, of course, the goal is to ensure your business continues to operate and to do it in a cost-effective way meeting standards of reasonable and prudent judgment.

4.3 Private and social attitudes to risk

It is typically assumed that households prefer a certain outcome to a risky outcome with the same expected payoff. That such risk-aversion exists is supported by the observation that the purchase of insurance policies is commonplace. The holding of shares with limited liability and of money, which pays no interest, can be similarly explained by the desire to avoid risk. Given that society is the sum of its members, does it follow from this that the government, as the representative of society, should also act in a risk-averse manner? The answer to this question has important implications for policy choice since a risk-averse government would undertake fewer risky projects than a risk-neutral one and would structure policies to avoid uncertainty in revenues and expenditures.

This section will first recall some aspects of the theory of household attitudes to risk and of the measurement of risk aversion. This is followed by a summary of alternative views on social attitudes to risk including the Arrow-Lind theorem that asserts the risk-neutrality of the government. The section is completed by an analysis of the valuation of projects in a contingent-commodity framework with, possibly, incomplete markets.

4.3.1 Private attitudes

Consider household h which derives utility level $U^h = U^h(M)$, $U^{h'}(\cdot) > 0$, from certain income M. Assuming that the preferences of the household satisfy the assumptions of von Neumann Morgernstern expected utility theory, so that the utility function is unique up to affine

transformations, the expected utility of receiving income level M with probability ρ and M with probability $1 - \rho$.

4.3.2 Social attitudes

The implication of household risk- aversion for the social treatment of risk has received considerable discussion and several alternative positions have been proposed. These are based upon differing views on the role of the government, its relation to the agents that compose the society over which it governs and its relative ability at dissipating risk.

A first view, propounded most forcefully by Hirshleifer (1964, 1966) and Sandmo (1972) is that the government should really not be given any privileged role with respect to risk bearing. In a perfect capital market, the decisions and attitudes to risk of the agents that constitute those markets are reflected in the equilibrium levels of discounting that are applied to risky projects since the market functions to allocate risks efficiently. As the market captures the views of agents, it is then argued that the government can do no better than to adopt the market rate of discounting when making its own project appraisal decisions. A further development of this argument would be to suggest that if the government did use a discount rate lower than the market rate, it would adopt projects that were socially undesirable and which displaced private sector projects with higher returns.

An alternative view, stated for example in Samuelson (1964) and Vickrey (1964), is that the government is in an advantageous position with respect to accepting risk relative to private sector agents. This advantage arises due to the size of the public sector and the number and variety of projects that it undertakes. If the returns from its various projects are not perfectly positively correlated, it is possible for the government to pool the risks arising from the projects and therefore lessen the overall uncertainty of its returns. The argument is then completed by noting

that an ability to pool risks allows a lower discount factor to be applied to any single risky project than would be done if the project were undertaken separately in the private sector.

There are several arguments that can be raised against this view. Firstly, projects should be evaluated individually by the public sector and not as a package as implied by the risk pooling argument. Packaging projects may result in some being adopted which are socially undesirable. Secondly, if the government is able to reduce risk by pooling, it should confer the advantages of doing so on the private sector rather than simply exploit them in the choice of public sector project. One method of doing so is by direct subsidy of the private sector in order to allow previously marginal projects to be adopted.

Rather than focus on the risk pooling ability of government, Arrow and Lind (1970) argue in favour of a lower discount factor for the public sector on the grounds of the ability of the public sector to spread risk. A simple version of this argument would go as follows. Although each taxpayer is risk-averse, the total cost of a project will be divided between taxpayers with each carrying only a small amount of the cost and therefore only a fraction of the risk. Provided that the number of taxpayers is sufficiently great, that the project is not large relative to the economy as a whole and that the (random) cost to any taxpayer of the project is not correlated with any existing uncertainty in their income stream, then as the number of taxpayers increases the risk premium of each taxpayer and the total risk premium to society tend to zero. Given this, the public sector should act as if it were risk-neutral.

To prove this theorem, consider an economy with H identical households who have identically distributed random incomes, M, and concave, bounded, strictly increasing and differentiable utility functions $U(M)$ which satisfy the axioms of expected utility theory. The government carries all costs of investment in a project and receives all returns. The payoff, less costs, is denoted by Π. Its budget is to be balanced in the absence of the project so positive returns from the project are given equally to the taxpayers (by reducing taxes) and costs are carried by the taxpayers (by raising taxes).

4.3.3 Summary

This section has considered alternative perspectives on the relation of social attitudes to risk to private attitudes. There is, of course, some merit in each of these proposals and it was shown how each could be generated as special cases of a general state-preference economy. As a final approach to this issue, Glazer (1989) has considered social attitudes to risk from a political perspective and has argued that strategic voting behaviour may lead to projects being adopted by the public sector that could only be rationalised by a discount rate below that of the private sector. This emphasises that the political outcome may remain distinct from that which is economically efficient. Private and institutional investors use fundamental analysis as their basis for stock purchases, while short-term traders use technical analysis. Since the risk-reward ratio and time horizons used in investing and trading are very different, it makes sense that these two different methods are employed. Investing and trading are very different animals, and their differences are characterized by the investing processes that fundamental and technical analysis illustrates.

Fundamental analysis relies on economic supply and demand information for the long term and company's financial health in the short term. An investor is informed of these conditions by stocks annual growth rate, five-year, one-year, and quarterly earnings records, and P/E (price-to-earnings) ratios. Investors reliant on fundamentals are more interested in stock's performance year to year than they are in market behavior. They do not fret when the market plunges one day and surges another, because their goal is the end result of steady, conservative growth.

Although fundamental analysis provides highly valuable information, many people do not have the time required to research the fundamentals. Taking an hour or more to research one company's new product potential and compare present and past earnings is too much for some, but certain fundamental concepts are simply invaluable. One such statistic is the EPS, or earnings-per-share ranking. Earnings-per-share are calculated by dividing a company's total after-tax profits by the company's number of common shares outstanding. You'll want to compare the EPS of the company in question to other comparable companies in the sector to see how your investment stacks up within the industry.

Technical Analysis is the alternate method of stock research, focused on the study of timing, price flocculation, and investor sentiment. The most common method of technical analysis is conducted with a chart that shows a stock's price history. We know that the prices represented in the chart do not occur randomly, and it is the collective mindset of all investors that creates prices. These buyers and sellers create patterns because they operate from memory. Different types of charts can be configured to show a wide variety of indicators and everyone has their personal favorites. By analyzing charts and price history a trader can attempt to predict market sentiment and stock price movement, but this is far from an objective science.

Technical analysis and fundamental analysis are the two basic sectors of reasoning that constitute the way investors and traders go about choosing stocks, and you must follow your own financial strengths in determining whether day trading or investing, and technical or fundamental analysis are right for you.

Conclusions

In a competitive economy with complete markets, the presence of uncertainty does not destroy the Pareto optimality of the equilibrium and suitably interpreted versions of the Two Theorems still apply. Indeed, efficiency is still achieved even if for each state there is only a single asset that has a positive return in that state. Despite these results there may still be a role for the public sector in an economy with complete markets if the public sector is able to bear risk more efficiently than the private sector. Whether the public sector should discount for risk at a lower rate than the private sector has been the subject of some dispute and alternative perspectives on this issue. In brief, the treatment of risk by the public sector is dependent upon the form of the risk that is involved, in the terminology used above whether it is inside or outside the private sector.

The effects of income and wealth taxation upon portfolio choice were considered and can be viewed as an example of how taxation affects risk taking. They also illustrated the manner in which the use of taxation turns the government into a partner in a household’s risk-taking activities. This also emphasised the distinction between private and social risk taking, with social

risk entering through the variability of government revenue. Similar effects were also noted in the treatment of taxation and labour supply with an uncertain wage and in the study of occupational choice. The design of optimal taxes involves issues that do not arise in an economy with certainty, in particular the specification of the government budget constraint and the range of policy tools. Furthermore, in addition to the revenue raising and re distributional roles of taxation, there is now the possibility that taxation can also provide social insurance by transferring from those who are benefiting from high random returns to those who are suffering low returns. This effect is sufficiently strong that a distortionary income tax can raise welfare in an economy of individuals who are identical except for random components in their wealth. More interestingly, the optimal linear income tax is preferable to a uniform lump-sum tax.

CHAPTER 5

Corporate Taxation

5.1 Introduction

The corporation is treated as a separate entity for tax purposes in all developed countries. It has been subject to numerous tax instruments with a variety of different motivations. The transfers between the corporation and its stockholders result in the behaviour of the corporation also being influenced by the structure of the personal tax system, most notably through the favorable tax treatment of capital gains. The intention of this chapter is to describe the relevant tax instruments and to determine their effects. This will give an insight into the many issues that arise in the analysis of corporate taxation.

This chapter is distinguished from those that proceed it by its focus upon the effects of taxation rather than upon optimisation exercises. There are several reasons for this. Input taxes have often been employed in many countries and the effects of such taxes are important because of this, but it has already been shown that they would not form part of an optimal tax system for a competitive economy. Therefore there is no need for a further study of optimisation. In simple settings where shareholders exercise direct control, the corporation cannot be identified as a entity distinct from its owners. A coherent tax structure would then involve a comprehensive income tax on owners, covering all sources of earnings, with no need for separate taxation of the corporation. Although the effects of corporation taxation are still of interest in such a framework since they suggest issues that may arise in more complex settings, optimisation is again of limited interest. When the setting becomes more complex, and the existence of managers leads to a separation between ownership and control, the task of clarifying the effects of taxation is difficult enough, without considering optimisation.

The next section will discuss the various taxes to which the corporation has been subject and will consider the rationale for treating the corporation as a distinct taxable entity. The incidence of a range of taxes will then be considered in a two-sector general equilibrium economy. This form of economy was popular in the 1970s following the work of Harberger (1962) and stills remains instructive. The incidence results will be derived in the simplest setting but a number of

extensions will also be described. As a tool for studying taxation of the corporation, the two-sector economy is restricted by its static nature and its lack of integration with the personal tax system. These features prevent the study of dividends and bonds and the consequences of preferential tax treatment of some sources of income. Adopting an intertemporal framework, we will consider the effect of taxation upon the policy of the corporation under both certainty and uncertainty.

5.2 Taxation of the firm

As has already been noted, the corporation (and the firm generally) has been subject to a range of taxes. This section will describe a number of these but with particular focus placed upon the corporate profits tax. This mirrors the emphasis upon this tax in the literature. A brief description will also be given of how the corporate tax system interacts with the personal tax system.

5.2.1 Input and output taxes

The most prevalent form of input tax has been that levied upon the employment of labour. In the US, the Social Security tax provides a notable example and the economics of this are discussed further. National Insurance payments play a similar role in the UK. Both the Social Security tax and National Insurance raise the cost of labour for the employer relative to the price of capital and other inputs. Another example of a tax on labour is the Selective Employment Tax which was levied in the UK between 1966 and 1973. The rate of Selective Employment Tax was sector-specific: it taxed employment in service industries and subsidized it in manufacturing. For further discussion of the effects of this tax see Reddaway (1970).

Factor subsidies have also been used to promote additional investment. Such subsidies have the effect of lowering the cost of additional units of capital relative to labour. These subsidies are often provided in the form of depreciation allowances but cash subsidies to some forms of investment in defined geographical areas were available under the 1972 Industry Act in the UK. The corporate profits tax has often been interpreted as a tax on capital in the corporate sector.

Viewing the provision of finance as an input to the corporation, there has also been differential treatment of payment to providers of finance. Interest payments to bondholders may be tax deductible for the firm, in contrast to dividends which are taxed. Provision of finance by equity holders may lead to capital gains which are taxed under the personal tax system at a different rate to interest received from bond holdings or from dividends. How these various provisions affect the choice of financial policy for the firm is investigated

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The Value Added Tax (VAT) levied by the European Union is essentially a tax on the output of the firm. The tax is based on the value added in production. Alternative taxes on output include production and turnover taxes. In contrast to the VAT, these are based on the gross output of the firm rather than its net output.

5.2.2 Profit tax

A tax on corporate profits is levied in all developed countries and is significant in the level of revenue it raises. Its economic effects have also been extensively analysed and this will be the focus of much of the analysis below. The discussion here will simply set the scene and point-up some of the issues that are addressed below.

With full allowance for capital expenditure, the firm will optimise, by choice of capital and labour, the level of after-tax profits given by-

$$\pi = [1 - \tau_c] [pF(K,L) - wL - rK],$$

Where τ c is the rate of profit taxation, p is the product price, *r* the rental rate on capital, *L* the labour employed and *K* the level of capital. It is clear from that, provided the tax rate is not greater than 100%, the firm's optimal choice of inputs will be unaffected by the imposition of the tax. In this circumstance, the profit tax will not cause any substitution effects in the pattern of input use by the firm. This should not be taken as a claim that the tax is completely without distortion. Since the firm's net of tax profit is reduced by the tax, its return to its owners will fall and this may cause substitution in the asset holdings of households and changes, for example, in their labour supply.

5.2.3 Personal taxes

The discussion of corporation tax given above provides a starting point for a more detailed analysis but, because of the form of most tax codes, the corporation tax cannot be considered in isolation from other aspects of the tax system. To briefly illustrate this consider a firm about to finance an extra unit of investment. This investment can be paid for either from retained earnings, from additional borrowing or from the issue of new equity. The fact that interest on borrowing may be tax deductible leads to an obvious incentive to borrow rather than issue equity. Also, the equity holders of the firm may experience capital gains and these will be taxed but at a lower rate than dividends. The response of the firm to corporation tax cannot then be seen in isolation from the capital gains tax. Furthermore, dividends may be taxed twice: once as profit to the firm and then as income for a shareholder. The decision of the firm in issuing dividends must then be considered with the corporation tax. Finally, the static nature of the analysis does not permit the discussion of investment. The corporation tax, by affecting financial policy, will affect the cost of investment and these needs to be addressed.

5.2.4 Why tax the corporation?

Having made these points about the structure and effects of taxes, there remains a further issue that must be addressed. This is the reason why the corporation is taxed at all. If the corporation is seen merely as earning income and transmitting this to its ultimate owners, then there is no

reason why the corporation should be taxed. Instead, the tax liability should be placed upon its owners alone. Kayand King (1990) provides a forceful exposition of this viewpoint. This argument reflects the view that the corporation does not have a personality or existence of its own other than that given to it in law.

The alternative perspective is that incorporation carries legal and economic privileges and that the corporation tax is a tax upon the gains enjoyed from the benefit of these privileges. Foremost among these privileges is the limited liability that the shareholders in the corporation enjoy in the event of bankruptcy. Another possible view, and one reflected in US Tax Reform Act of 1986 which shifted the tax burden from the personal sector to the corporate sector, is that corporations can afford to pay taxes and should therefore carry their share of the burden. There is also the argument, already explored above, that corporation tax is taxing rent so is a distortion-free way of raising revenue. As already noted, there are limits to how far this argument can be pushed since it relies at the very least on the tax being levied on true economic profit.

Ultimately, the effect of a tax depends upon how it affects the individuals in the economy and the correctness, or otherwise, of taxing the corporation depends upon the final incidence of the tax. If the tax can achieve objectives, and so raise social welfare, that other taxes cannot then there is a justification for its existence. In a sense, many of the arguments noted above simply direct attention away from the main justification for introducing any form of taxation, which is to achieve specified aims. As is always the case in Second-Best theory, although a policy instrument may have no role in the First-Best, its use may still be justified in other circumstances.

5.3 Tax incidence

One aspect that has already been stressed in earlier chapters is that the economic incidence of a tax is rarely the same as the legal incidence. Legal incidence relates to who has to formally pay the tax to the tax collection agency whereas economic incidence is identified by the agents who suffer reduced welfare due to the imposition of the tax. Since there are general equilibrium

repercussions to any tax change, the identification of economic incidence is not always a straight forward exercise.

In terms of the corporation tax, Harberger (1962) was the first to present a comprehensive analysis of incidence. The framework employed was that of a two-sector economy with two factors of production: capital and labour. One of the sectors of the economy was treated as incorporated and capital in that sector bore the legal incidence of the corporation tax. This framework permitted identification of the real effects of the corporation tax in terms of an output effect, capturing the change in the relative outputs of the two goods, and an input substitution effect, representing the adjustment of inputs within sectors. In addition, Harberger also calculated the change in relative factors rewards in order to determine the economic incidence of the tax in terms of whether the tax burden fell on capital or labour. In the period since its publication, the Harberger analysis has been subject to many extensions and modifications, many of which are detailed in the surveys of Mieszkowski (1969) and McLure (1975). The analysis of this section will describe the Harberger economy and show how this can be employed to derive results on the incidence of the corporation tax and a range of other tax instruments. Some of the extensions will then be described. The analytical technique used to solve the incidence question follows closely the original development of Harberger (1962) and its description in Shoven and Whalley (1972).

5.3.1 Extensions

Since the publication of Harberger (1962), many extensions of the analysis have been completed. Included among these are studies that have simply addressed the same issues but under alternative assumptions and others that have applied the analysis, often under very similar assumptions, to different issues. A survey of the latter, which will not be covered here, can be found in McLure (1975).

In addition, Jones (1965, 1971) and McLure (1974) have developed alternative analytical techniques for studying the Harberger economy. The extensions that are now discussed are those that modify the structure of the Harberger economy in order to relax the restrictiveness of its assumptions.

Intermediate goods

The main effect of the introduction of intermediate goods into the Harberger economy is to increase the possibilities for substitution between inputs. Unless the technology is Leontief with fixed input coefficients, these substitution possibilities modify the conclusions on tax incidence. In a series of papers, Bhatia (1981, 1982a, 1982b, 1986) has addressed these issues.

Income effects

The discussion of the demand function described how income effects were eliminated by the assumptions that infinitesimal taxes were introduced from an initial position with no taxation and that the government spent the tax revenue in the same way as consumers. This assumption has been relaxed in two ways. Mieszkowski (1967) considered demand to be derived from two distinct groups of consumers whilst Ballentine and Eris (1975) retain the Harberger specification but incorporate income effects for non-infinitesimal tax changes. The consumers in Mieszkowski (1967) are comprised of workers, who earn income from the supply of labour, and capitalists, who receive the return from capital. In such a framework, a number of anomalies may arise when compared to the standard Harberger analysis. For instance, when these two groups have very divergent spending propensities and the elasticities of substitution in production are small, a tax on capital in the capital intensive sector may increase demand for that sector's commodity and increase the price of capital relative to labour. Since the same general principals are involved, this analysis also suggests the possibilities that would arise if the government did not spend its revenue in the same way as consumers.

5.4 Taxation and finance

An important issue in the study of corporate taxation is the question of how the tax system affects the financing of a firm and the investment plans of the firm. To finance investment, a firm has three sources of finance. The firm can issue new equity, it can issue bonds or it can employ retained earnings. The issue of new equity makes the firm liable for future dividend payments,

but does not commit the firm to any specific level of payment, whereas bonds involve a fixed commitment to pay interest and, eventually, to redeem the bonds. A profit maximising firm will naturally wish to choose the mix of these three instruments that finance the investment at minimum cost. Furthermore, the extent of future investment will in turn be determined by the cost of finance, usually referred to as the cost of capital. The focus is therefore upon how the tax system influences the means of finance and the cost of capital.

Most of the issues involved can be treated adequately under the assumption of certainty with all agents in the economy fully informed of the future prospects of the firm. However, the assumption of certainty does imply some restrictions. With certainty, there can be no possibility of any firm becoming bankrupt since such a firm would simply not operate. In contrast, in an economy with uncertainty there may be some states of nature in which a firm is unable to meet its obligations, essentially the contractual payments to bondholders, and therefore has to go into bankruptcy. The consequences of this will be discussed further below. A second issue that arises in the presence of uncertainty is that of the objective of the firm. In an economy with certainty, there will be unanimous agreement of the shareholders that the firm should maximise its profits. This need not be the case with uncertainty if there are incomplete markets. Generally, the problem facing the firm is that of aggregating the diverse preferences of its shareholders into a single objective. The issues that arise with uncertainty have not been fully resolved and this limits what can be said about the effects of taxation.

5.5 Systems of corporate and personal taxation

The tax system that is now described is commonly termed the classical system and is in use in the US and many other countries. This is to be distinguished for the imputation system used in the UK and the two-rate system; these are described later.

The motivation behind the classical system is that the corporate tax is a tax on the benefits that follow from incorporation. As such, the tax liability of the corporation is treated as entirely distinct from that of the shareholders of the company. Consequently, profits are taxed at the rate

set for corporation tax, dividends are taxed at the personal income tax rate applicable to the shareholders who receive them, as is interest received by the bondholders of the firm, and a separate rate applies to capital gains which are levied on realisation of those gains. Interest paid by the firm is tax-deductible. Many of the consequences of this tax system with respect to corporate finance follow from the distortions introduced by the differential tax treatment of dividends and interest payments. In what follows, the rate of corporation tax will be denoted τc, dividends are taxed at the personal rate τp and capital gains at the rate τg. To reflect the reality of tax codes, it is assumed that $\tau g < \tau p$.

One of the perceived difficulties of the classical system is the double taxation of dividends: they are taxed once as corporate profit and then again as personal income. The imputation system represents an attempt to avoid this double taxation by integrating the corporate and personal tax systems. It does this by giving each shareholder a credit for the tax paid by the company on the profit out of which dividends are paid. In essence, any profits distributed as dividends are deemed to have already been subject to personal tax at what is known as the rate of imputation. The shareholder receiving the dividend is then only liable for the difference between the rate of imputation and their personal tax rate. In the UK the rate of imputation is equal to the standard rate of tax. A further alternative system that has been employed in the UK and in West Germany and Japan is the two-rate system. Under this system different tax rates apply to distributed and undistributed profits with the latter being taxed at a higher rate. This is designed to partly offset the double taxation of dividends inherent in the classical system. King (1977) provides further discussion of alternative systems of corporation tax.

5.6 Conclusions

This chapter has considered the effect of corporate taxation upon both the productive activities of the firm and its choice of financial policy. These represent the two channels through which the corporation interacts with the other agents in the economy. The structure of the chapter involved a process of moving from the analysis of the productive decisions of the corporation in the Harberger economy to the combination of financial and investment decisions in an uncertain environment. The analysis of financial policy emphasised the importance of both the corporate

tax system and the personal tax system for the determination of financial policy. The effect of taxation in determining financial policy is emphasised most emphatically when contrasted with the conclusion of the Modigliani-Miller theorem which asserts the irrelevance to the firm's value of the choice between equity and debt.

CHAPTER 6
Public Goods

6.1 Introduction

When a public good is provided, it can be consumed collectively by all households. Such collective consumption violates the assumption of the private nature of the goods in the Arrow-Debreu competitive economy. The existence of public goods then leads to a failure of the competitive equilibrium to be efficient. Such failure implies a potential role for the state in public good provision to overcome the failure of the market.

The formal analysis of public goods began with Samuelson (1954) who derived the rule characterising efficient levels of provision and, after defining some necessary terms, this will also be the starting point of this chapter. Efficient provision will be considered for pure public goods and for public goods subject to congestion. The theme of efficiency is continued into the study of Lindahl equilibria with personalised prices. Following this, the analysis of private provision demonstrates the nature of the outcome when prices are uniform and illustrates why a competitive market fails to attain efficiency.

If government provision is to be justified, it must be shown that the government can improve upon the market outcome. What can be achieved when policy instruments are restricted to commodity taxation and uniform lump-sum taxes? In seeking the attainment of an efficient outcome, the government is faced with informational constraints of which the lack of knowledge of household preferences is the most significant. Mechanism design shows why households may choose to misrepresent their preferences and how mechanisms can be designed to overcome this. Finally, the chapter is completed by a review of experimental evidence on private provision and preference revelation, and the use of market data to elicit valuations.

6.2 Definitions

A public good can be distinguished from a private good by the fact that it can provide benefits to a number of users simultaneously whereas a private good can, at any time, only benefit a single user. If the public good can accommodate any number of users then it is said to be pure. It is impure when congestion can occur. This section defines a public good, clarifies the distinction between pure and impure and develops its economic implications.

6.2.1 Pure public goods

The pure public good has been the subject of most of the economic analysis of public goods. In some ways, the pure public good is an abstraction that is adopted to provide a benchmark case against which other results can be assessed. Before proceeding, it should be noted that public goods can take the form of inputs into production in addition to their more commonly-presented role as objects of consumption. A simple translation of the comments below can be made in order to allow them to describe the public good as an input.

A pure public good has the following two properties.

Non-excludability

If the public good is supplied, no household can be excluded from consuming it except, possibly, at infinite cost.

Non-rivalry

Consumption of the public good by one household does not reduce the quantity available for consumption by any other.

Consumption of the public good by one household does not reduce the quantity available for consumption by any other. The implication of non-excludability is that consumption cannot be controlled efficiently by a price system since no household can be prevented from consuming the public good if it is provided. It is evident that a good satisfying this condition does not fit into the framework of the competitive economy used to derive the Two Theorems of Welfare Economics. In the form given, those theorems are inapplicable to an economy with public goods.

From the property of non-rivalry it can be deduced that all households can, if they so desire, simultaneously consume a level of the public good equal to its total supply. If it is possible for

households not to consume the public good, then some may consume less. In the latter case, the public good may satisfy free-disposal, so that consumption can be reduced at no cost, or else disposal can be costly. Further discussion of the modelling of free-disposal is given in Milleron (1972) and of costly disposal in Oakland (1987). When all households must consume, or want to consume, to the maximum, the welfare level of each household is dependent on the total public good supply.

In reality, it is difficult to find any good that satisfies both the conditions of non-excludability and non-rivalry precisely. For example, the transmission of a television signal will satisfy non-rivalry but exclusion is possible at finite cost. Similar comments apply, for example, to defence spending which will eventually be rivalrous and from which exclusion is possible.

6.2.2 Impure public goods and congestion

In practice, public goods tend to eventually suffer from congestion when usage is sufficiently great. Obvious examples include parks and roads. Congestion results in a reduction in the return the public good gives to each user as the use of a given supply by households increases. Such public goods are termed impure. The utility derived by each household from an impure public good is an increasing function of the level of supply and a decreasing function of its use. There are a number of ways of representing the effect of congestion upon preferences and some of these will be described when optimal provision is characterised.

To obtain further insight into these definitions it may be helpful to think of a continuum of types of good running from purely private goods, for which there is complete rivalry and exclusion at zero cost, to pure public goods. With a pure public good it is possible for both to consume a maximum of 1 unit. In contrast, the private good must be divided between the households. The consumption possibilities for an impure public good lies between these limits.

6.3 Optimal provision

The characterisation of the efficient provision of a pure public good was first published in Samuelson (1954) and was followed by a diagrammatic explanation in Samuelson (1955). For

this reason, the rule for efficient provision is typically called the Samuelson rule. The following analysis will derive the Samuelson rule for a pure public good, with and without free disposal, and for public inputs and public goods with congestion.

6.4 Personalised prices and the Lindahl equilibrium

Now that the rule for Pareto efficient provision has been derived the natural question is whether there is any form of economy in which competitive behaviour will lead to an efficient outcome. This arises from the fact that consumers differ in the valuation they place upon a given supply of the public good. Insisting that they all pay an identical price for the supply cannot therefore be efficient.

Following this reasoning, it would appear likely that Pareto efficiency would result if each consumer could pay an individual or personalised price for the good. In this way, each will be paying a price that reflects their valuation. Allowing such personalised prices represents an extension of the Arrow-Debreu economy which assumed that each commodity had a single price. The equilibrium with personalised prices is often called a Lindahl equilibrium after its introduction by Lindahl (1919). Two variants of the Lindahl equilibrium will be described in this section. The first is for a simple economy with two households in which the price of the public good is given by the share of the cost of the public good each household must cover. Following this, it is shown how efficiency can be sustained in a competitive economy with truly personalised prices. The section is completed by analysing the relationship of the Lindahl equilibrium, and its extensions, to the core.

6.4.1 Comments

The Lindahl equilibrium demonstrates how efficiency can be attained in an economy with public goods by the use of personalised prices. The personalised prices succeed in equating the individual valuations of the supply of public goods to the cost of production in a way that uniform pricing cannot. These are important observations that support the relevance of the Lindahl equilibrium concept.

Unfortunately, the Lindahl equilibrium is not without fault. It is central to the equilibrium that each household should face a price system that is designed to capture that household's evaluation of the public good supply. When it participates in the public goods market each household is the only purchaser at its particular price ratio and is not in the position it would be in a competitive market of being one purchaser among many. In a competitive equilibrium there is no incentive for the household to act in any other way than just to purchase its most preferred consumption plan. In contrast, the fact that the household is in a stronger position in the Lindahl equilibrium raises the very clear possibility that it can gain by false revelation of preferences in an attempt to adjust equilibrium prices to its advantage. Such strategic behaviour on the part of households undermines the foundation of the Lindahl equilibrium. If it does occur, the Lindahl equilibrium with strategic behaviour no longer possesses the efficiency properties set out above.

6.5 Private provision of public good

The characterisation of optimal provision in Section 3 was concerned with an economy in which the government provided the public good and was unrestricted in its policy instruments. This first-best outcome is now contrasted to the equilibrium of an economy in which the public good is funded entirely by the voluntary contributions of individual households. Economies with government provision alone and those with only private provision should be seen as the two extreme cases since in practice, as charitable donations indicate, public goods are usually provided by a combination of both methods. The focus of the analysis will be upon the welfare properties of the private provision equilibrium and the level of public good supply relative to efficient levels. In addition, the effect of the number of households on supply and changes in the income distribution will also be considered.

In order to analyse private provision, it is necessary to make an assumption about how each household expects their contribution to the provision of public goods to affect the contributions of others. The assumption that was made in the initial literature on private provision (for example Bergstrom, Blume and Varian (1986), Chamberlin (1974, 1976), Cornes and Sandler (1985), McGuire (1974) and Young (1982)) was the standard Nash assumption: in planning their

contribution, each household takes the contribution of the others as given. This is not the only assumption and alternatives have been investigated.

In every national budget, there is a part called "Public Procurement". This is the portion of the budget allocated to purchasing services and goods for the various ministries, authorities and other arms of the executive branch. It was the famous management consultant, Parkinson, who once wrote that government officials are likely to approve a multi-billion dollar nuclear power plant much more speedily that they are likely to authorize a hundred dollar expenditure on a bicycle parking device. This is because everyone came across 100 dollar situations in real life - but precious few had the fortune to expend with billions of USD.

This, precisely, is the problem with public procurement: people are too acquainted with the purchased items. They tend to confuse their daily, household-type, decisions with the processes and considerations which should permeate governmental decision making. They label perfectly legitimate decisions as "corrupt" - and totally corrupt procedures as "legal" or merely "legitimate", because this is what was decreed by the stately mechanisms, or because "this is the law".

Procurement is divided to defense and non-defense spending. In both these categories - but, especially in the former - there are grave, well founded, concerns that things might not be all what they seem to be. Government - from India's to Sweden's to Belgium's - fell because of procurement scandals which involved bribes paid by manufacturers or service providers either to individual in the service of the state or to political parties. Other, lesser cases litter the press daily. In the last few years only, the burgeoning defense sector in Israel saw two such big scandals: the developer of Israel's missiles was involved in one (and currently is serving a jail sentence) and Israel's military attaché to Washington was implicated - though, never convicted - in yet another. But the picture is not that grim. Most governments in the West succeeded in reigning in and fully controlling this particular budget item. In the USA, this part of the budget remained constant in the last 35(!) years at 20% of the GDP.

There are many problems with public procurement. It is an obscure area of state activity, agreed upon in "customized" tenders and in dark rooms through a series of undisclosed agreements. At least, this is the public image of these expenditures. True, some ministers use public money to build their private "empires". It could be a private business empire, catering to the financial future of the minister, his cronies and his relatives. These two plagues - cronyism and nepotism - haunt public procurement. The specter of government official using public money to benefit their political allies or their family members - haunts public imagination and provokes public indignation.

Then, there are problems of plain corruption: bribes or commissions paid to decision makers in return for winning tenders or awarding of economic benefits financed by the public money. Again, sometimes these moneys end in secret bank accounts in Switzerland or in Luxembourg. At other times, they finance political activities of political parties. This was rampantly abundant in Italy and has its place in France. The USA, which was considered to be immune from such behaviors - has proven to be less so, lately, with the Bill Clinton alleged election financing transgressions. But, these, with all due respect to "clean hands" operations and principles, are not the main problems of public procurement.

The first order problem is the allocation of scarce resources. The needs are enormous and ever growing. The US government purchases hundreds of thousands of separate items from outside suppliers. Just the list of these goods - not to mention their technical specifications and the documentation which accompanies the transactions - occupies tens of thick volumes. Supercomputers are used to manage all these - and, even so, it is getting way out of hand. How to allocate ever scarcer resources amongst these items is a daunting - close to impossible - task. It also, of course, has a political dimension. A procurement decision reflects a political preference and priority. But the decision itself is not always motivated by rational - let alone noble - arguments. More often, it is the by product and end result of lobbying, political hand bending and extortionist muscle. This raises a lot of hackles among those who feel that were kept out of the pork barrel. They feel underprivileged and discriminated against. They fight back and the whole system finds itself in a quagmire, a nightmare of conflicting interests. Last year, the whole

budget in the USA was stuck - not approved by Congress - because of these reactions and counter-reactions.

6.6 Summary

In the absence of government intervention, public good provision will be left to the private contributions of households. The basic model of private provision is built upon the assumption of Nash behaviour and it has been shown that this leads to an inefficient outcome. In addition, the equilibrium level of provision is invariant to changes in the income distribution and exogeneous changes in public good supply. These properties, and the limiting behaviour of the equilibrium, are at variance with empirical observations. Alternative conjectures have been analysed but these are entirely arbitrary and do not provide a better explanation of reality. Altering the structure of preferences and the social rules do provide improved predictions but no alternative has yet received convincing arguments in its favour.

6.7 Finance by taxation

The rules for efficient provision require for their implementation that there are no restrictions upon the tax instruments that can be employed by the government or, equivalently, that the government has complete control over resource allocation. When optimal lump-sum taxes are not an available policy instrument the rule for provision, and the resulting level of provision, must take account of the method of finance. In particular, the gain in welfare enjoyed due to the provision of the public good has to be offset against any distortions caused by the method of finance. This section considers the implications of methods of financing in an economy with a set of identical consumers, which effectively behaves as a single-consumer economy with no distributional aspects, and in a Diamond-Mirrlees economy with many consumers.

6.7.1 Identical consumers

In an economy with many identical consumers, if a lump-sum tax can be employed at all it must feasible to choose the optimal lump-sum tax. To provide content to the analysis it is therefore assumed that the only tax instruments available to the government to finance the public good are commodity taxes. This will be relaxed when differentiated consumers are considered and restricted lump-sum taxes become meaningful. The aim of the analysis is to determine how the distortions caused by the commodities taxes affect the Samuelson Rule and the level of provision. This is undertaken by following the work of Atkinson and Stern (1974).

6.7.2 Differentiated households

Allowing the households to differ in their income and preferences provides motivation for considering restricted forms of lump-sum taxation. Even though an optimal set of lump-sum taxes may not be feasible, it may well remain possible to levy a uniform lump-sum tax. At the margin, such taxes have the property of providing a non-distortionary source of finance.

Now consider an economy with an arbitrary, but non-zero , set of commodity tax rates and implied consumer prices which are taken as fixed. Since the private sector of the economy is distorted by the existence of the commodity taxes, the non-distortionary uniform lump-sum tax provides a means by which resources can be moved from the distorted sector into provision of the public good. It does not then seem unreasonable that if the private sector is sufficiently distorted, more resources would be moved to the public sector than at the first best optimum. This will result in the second-best provision of the public good being above the first-best.

6.8 Summary

The results have shown how distortionary financing affects the form of the Samuelson rule. Although there is a presumption that when finance is entirely by commodity taxation the second-best level of provision will fall below the first-best, this has not been formally established and the form suggests that it cannot be. In contrast, when some financing can be undertaken by lumpsum taxation their non-distortionary nature provides a reason for second-best provision to rise above first-best and examples have been constructed to confirm this Mechanism design.

CHAPTER 7
Externalities

7.1 Introduction

An externality represents a connection between economic agents which lies outside the price system of the economy. As the level of externality generated is not controlled directly by price, the standard efficiency theorems on market equilibrium cannot be applied. The market failure that can result raises a potential role for correction through policy intervention.

Externalities and their control are a subject of increasing practical importance. The greenhouse effect is one of the most significant examples of the consequences of an externality but there are any number of others, from purely local environmental issues to similarly global ones. Although these may not appear at first sight to be economic problems, many of the policy responses to their existence have been based on the economic theory of externalities. The purpose of this chapter is to demonstrate the consequences of the existence of externalities and to the review policy responses that have been suggested. In particular, it will be shown how the unregulated economy generally fails to reach an efficient outcome and to what degree this can be corrected using standard tax instruments.

In economics, an externality is the cost or benefit that affects a party who did not choose to incur that cost or benefit.

For example, manufacturing activities that cause air pollution impose health and clean-up costs on the whole society, whereas the neighbors of an individual who chooses to fire-proof his home may benefit from a reduced risk of a fire spreading to their own houses. If external costs exist, such as pollution, the producer may choose to produce more of the product than would be produced if the producer were required to pay all associated environmental costs. If there are external benefits, such as in public safety, less of the good may be produced than would be the case if the producer were to receive payment for the external benefits to others. For the purpose of these statements, overall cost and benefit to society is defined as the sum of the imputed

monetary value of benefits and costs to all parties involved. Thus, it is said that, for goods with externalities, unregulated market prices do not reflect the full social costs or benefit of the transaction.

7.2 Externalities

Although the nature of an externality as an effect inflicted by one agent upon another may seem very clear at an intuitive level, once a formalisation is attempted a number of issues arise that need to be resolved. Of most importance is the question of whether the existence of an externality should be judged by its effects or by its consequences. Since both approaches have some merit, but can lead to different classifications, there is no universally agreed definition of an externality. This section discusses two alternative definitions and describes the representation of externalities adopted in the following analysis.

7.3 Implications

Voluntary exchange is considered mutually beneficial to both parties involved, because buyers or sellers would not trade if either thought it detrimental to themselves. However, a transaction can cause additional effects on third parties. From the perspective of those affected, these effects may be negative (pollution from a factory), or positive (honey bees kept for honey that also pollinate neighboring crops). Neoclassical welfare economics asserts that, under plausible conditions, the existence of externalities will result in outcomes that are not socially optimal. Those who suffer from external costs do so involuntarily, whereas those who enjoy external benefits do so at no cost.

A voluntary exchange may reduce societal welfare if external costs exist. The person who is affected by the negative externalities in the case of air pollution will see it as lowered utility: either subjective displeasure or potentially explicit costs, such as higher medical expenses. The externality may even be seen as a trespass on their lungs, violating their property rights. Thus, an external cost may pose an ethical or political problem. Alternatively, it might be seen as a case of poorly defined property rights, as with, for example, pollution of bodies of water that may belong

to no one (either figuratively, in the case of publicly owned, or literally, in some countries and/or legal traditions).

On the other hand, a positive externality would increase the utility of third parties at no cost to them. Since collective societal welfare is improved, but the providers have no way of monetizing the benefit, less of the good will be produced than would be optimal for society as a whole. Goods with positive externalities include education (believed to increase societal productivity and well-being; but controversial, as these benefits are generally internalized, e.g., in the form of higher wages), public health initiatives (which may reduce the health risks and costs for third parties for such things as transmittable diseases) and law enforcement. Positive externalities are often associated with the free rider problem. For example, individuals who are vaccinated reduce the risk of contracting the relevant disease for all others around them, and at high levels of vaccination, society may receive large health and welfare benefits; but any one individual can refuse vaccination, still avoiding the disease by "free riding" on the costs borne by others.

There are a number of potential means of improving overall social utility when externalities are involved. The market-driven approach to correcting externalities is to "internalize" third party costs and benefits, for example, by requiring a polluter to repair any damage caused. But, in many cases internalizing costs or benefits is not feasible, especially if the true monetary values cannot be determined.

Laissez-faire economists such as Friedrich Hayek and Milton Friedman sometimes refer to externalities as "neighborhood effects" or "spillovers", although externalities are not necessarily minor or localized. Similarly, Ludwig von Mises argues that externalities arise from lack of "clear personal property definition."

7.4 Negative externality

A negative externality (also called "external cost" or "external diseconomy") is an action of a product on consumers that imposes a negative effect on a third party; it is "external cost".

Barry Commoner commented on the costs of externalities:

> Clearly, we have compiled a record of serious failures in recent technological encounters with the environment. In each case, the new technology was brought into use before the ultimate hazards were known. We have been quick to reap the benefits and slow to comprehend the costs.

Many negative externalities are related to the environmental consequences of production and use. The article on environmental economics also addresses externalities and how they may be addressed in the context of environmental issues.

- Air pollution from burning fossil fuels causes damages to crops, (historic) buildings and public health. The most extensive and integrated effort to quantify and monetise these impacts was in the European external project series.
- Anthropogenic climate change is attributed to greenhouse gas emissions from burning oil, gas, and coal. The *Stern Review on the Economics Of Climate Change* says "Climate change presents a unique challenge for economics: it is the greatest example of market failure we have ever seen."
- Water pollution by industries that adds effluent, which harms plants, animals, and humans.
- Noise pollution which may be mentally and psychologically disruptive.
- Systemic risk describes the risks to the overall economy arising from the risks that the banking system takes. A condition of moral hazard can occur in the absence of well-designed banking regulation, or in the presence of badly designed regulation.
- Industrial farm animal production, on the rise in the 20th century, resulted in farms that were easier to run, with fewer and often less-skilled employees, and a greater output of uniform animal products. However, the externalities with these farms include "contributing to the increase in the pool of antibiotic-resistant bacteria because of the overuse of antibiotics; air quality problems; the contamination of rivers, streams, and coastal waters with concentrated animal waste; animal welfare problems, mainly as a result of the extremely close quarters in which the animals are housed."
- The harvesting by one fishing company in the ocean depletes the stock of available fish for the other companies and overfishing may be the result. The stock fish is an example

of a common property resource, and that, in the absence of appropriate environmental governance, is vulnerable to the *Tragedy of the commons*.

- When car owners use roads, they impose congestion costs and higher accident risks on all other users.
- Consumption by one consumer causes prices to rise and therefore makes other consumers worse off, perhaps by reducing their consumption. These effects are sometimes called "pecuniary externalities" and are distinguished from "real externalities" or "technological externalities". Pecuniary externalities appear to be externalities, but occur within the market mechanism and are not a source of market failure or inefficiency.
- Shared costs of declining health and vitality caused by smoking and/or alcohol abuse. Here, the "cost" is that of providing minimum social welfare. Economists more frequently attribute this problem to the category of moral hazards, the prospect that parties insulated from risk may behave differently from the way they would if they were fully exposed to the risk. For example, individuals with insurance against automobile theft may be less vigilant about locking their cars, because the negative consequences of automobile theft are (partially) borne by the insurance company.
- The cost of storing nuclear waste from nuclear plants for more than 1,000 years (over 100,000 for some types of nuclear waste) is included in the cost of the electricity the plant produces, in the form of a fee paid to the government and held in the nuclear waste superfund. Conversely, the costs of managing the long term risks of disposal of chemicals, which may remain permanently hazardous, is not commonly internalized in prices. The USEPA regulates chemicals for periods ranging from 100 years to a maximum of 10,000 years, without respect to potential long-term hazard.
- Antibiotic use contributes to antibiotic resistance, reducing the future effectiveness of antibiotics. Individuals do not consider this efficacy cost when making usage decisions, leading to socially sub-optimal antibiotic consumption. Government policies proposed to preserve future antibiotic effectiveness include educational campaigns, regulation, Pigouvian taxes, and patents.
- In relation to 'environmental victims', externalities can often represent 'loss-costs', which reflects Kantian ideas of a distinction between 'value' that can be replaced, and 'dignity' which cannot.

7.5 Positive externality

Examples of **positive externalities** (beneficial externality, external benefit, external economy, or Merit goods) include:

- Increased education of individuals can lead to broader society benefits in the form of greater economic productivity, a lower unemployment rate, greater household mobility and higher rates of political participation.
- A beekeeper keeps the bees for their honey. A side effect or externality associated with such activity is the pollination of surrounding crops by the bees. The value generated by the pollination may be more important than the value of the harvested honey.
- An individual who maintains an attractive house may confer benefits to neighbors in the form of increased market values for their properties.
- An individual buying a product that is interconnected in a network (e.g., a video cell phone) will increase the usefulness of such phones to other people who have a video cell phone. When each new user of a product increases the value of the same product owned by others, the phenomenon is called a network externality or a network effect. Network externalities often have "tipping points" where, suddenly, the product reaches general acceptance and near-universal usage.
- In an area that does not have a public fire department; homeowners who purchase private fire protection services provide a positive externality to neighboring properties, which are less at risk of the protected neighbor's fire spreading to their (unprotected) house.
- An individual receiving a vaccination for a communicable disease not only decreases the likelihood of the individual's own infection, but also decreases the likelihood of others becoming infected through contact with the individual.
- A foreign firm demonstrates up-to-date technologies to local firms and improves their productivity.

The existence or management of externalities may give rise to political or legal conflicts.

Collective solutions or public policies are sometimes implemented to regulate activities with positive or negative externalities.

7.6 Positional externalities

Positional externalities refer to a special type of externality that depends on the relative rankings of actors in a situation. Because every actor is attempting to "one up" other actors, the consequences are unintended and economically inefficient.

One example is the phenomenon of "over-education" (referring to post-secondary education) in the North American labour market. In the 1960s, many young middle-class North Americans prepared for their careers by completing a bachelor's degree. However, by the 1990s, many people from the same social milieu were completing master's degrees, hoping to "one up" the other competitors in the job market by signalling their higher quality as potential employees. By the 2000s, some jobs that had previously required only bachelor's degrees, such as policy analysis posts, were requiring master's degrees. Some economists argue that this increase in educational requirements was above that which was efficient, and that it was a misuse of the societal and personal resources that go into the completion of these master's degrees.

Another example is the buying of jewelry as a gift for another person, e.g. a spouse. For Husband A to show that he values Wife A more than Husband B values Wife B, Husband A must buy more expensive jewelry than Husband B. As in the first example, the cycle continues to get worse, because every actor positions him- or herself in relation to the other actors. This is sometimes called keeping up with the Joneses.

One solution to such externalities is regulations imposed by an outside authority. For the first example, the government might pass a law against firms requiring master's degrees unless the job actually required these advanced skills.

7.7 Possible outcomes

There are at least four general types of solutions to the problem of externalities:

- Civil Tort law
- Criminalization

- Government provision
- Pigovian taxes or subsidies intended to redress economic injustices or imbalances.

A Pigovian tax (also called Pigouvian tax, after economist Alfred Pigou) is a tax imposed that is equal in value to the negative externality. The result is that the market outcome would be reduced to the efficient amount. A side effect is that revenue is raised for the government, reducing the amount of distortionary taxes that the government must impose elsewhere. Economists prefer Pigovian taxes and subsidies as being the least intrusive and most efficient method to resolve externalities. Governments justify the use of Pigovian taxes saying that these taxes help the market reach an efficient outcome because this tax bridges the gap between marginal social costs and marginal private costs.

Some arguments against Pigovian taxes say that the tax does not account for all the transfers and regulations involved with an externality. In other words, the tax only considers the amount of externality produced. Another argument against the tax is that it does not take private property into consideration. Under the Pigovian system, one firm, for example, can be taxed more than another firm, even though the other firm is actually producing greater amounts of the negative externality.

However, the most common type of solution is a tacit agreement through the political process. Governments are elected to represent citizens and to strike political compromises between various interests. Normally governments pass laws and regulations to address pollution and other types of environmental harm. These laws and regulations can take the form of "command and control" regulation (such as setting standards, targets, or process requirements), or environmental pricing reform (such as eco taxes or other Pigovian taxes, tradable pollution permits or the creation of markets for ecological services). The second type of resolution is a purely private agreement between the parties involved.

Government intervention might not always be needed. Traditional ways of life may have evolved as ways to deal with external costs and benefits. Alternatively, democratically run communities can agree to deal with these costs and benefits in an amicable way. Externalities can sometimes be resolved by agreement between the parties involved. This resolution may even come about because of the threat of government action.

Ronald Coase argued that if all parties involved can easily organize payments so as to pay each other for their actions, then an efficient outcome can be reached without government intervention. Some take this argument further, and make the political claim that government should restrict its role to facilitating bargaining among the affected groups or individuals and to enforcing any contracts that result. This result, often known as the Coase theorem, requires that

- Property rights be well defined
- People act rationally
- Transaction costs be minimal

If all of these conditions apply, the private parties can bargain to solve the problem of externalities.

This theorem would not apply to the steel industry case discussed above. For example, with a steel factory that trespasses on the lungs of a large number of individuals with pollution, it is difficult if not impossible for any one person to negotiate with the producer, and there are large transaction costs. Hence the most common approach may be to regulate the firm (by imposing limits on the amount of pollution considered "acceptable") while paying for the regulation and enforcement with taxes. The case of the vaccinations would also not satisfy the requirements of the Coase theorem. Since the potential external beneficiaries of vaccination are the people themselves, the people would have to self-organize to pay each other to be vaccinated. But such an organization that involves the entire populace would be indistinguishable from government action.

In some cases, the Coase theorem is relevant. For example, if a logger is planning to clear-cut a forest in a way that has a negative impact on a nearby resort, the resort-owner and the logger could, in theory, get together to agree to a deal. For example, the resort-owner could pay the logger not to clear-cut – or could buy the forest. The most problematic situation, from Coase's perspective, occurs when the forest literally does not belong to anyone; the question of "who" owns the forest is not important, as any specific owner will have an interest in coming to an agreement with the resort owner (if such an agreement is mutually beneficial).

CHAPTER 8

Imperfect Competition

8.1 Introduction

In the previous chapters, the assumption of competitive behaviour has been maintained throughout. It is often best to view this as a useful restriction for developing initial ideas and eliminating unnecessary complication. As a representation of reality it is clearly flawed, an observation easily supported by casual empiricism. This chapter relaxes the competitive assumption and reviews some of the major results that have been derived within the framework of imperfect competition.

The first point to note is that there are numerous forms of imperfect competition which vary with respect to the nature of products, the strategic variables of the firms, the objectives of the firms and the possibility of entry. Products may be homogeneous or differentiated and the strategic variables of the firms can either be prices or quantities with, possibly, additional instruments such as investment or advertising. The firms' objectives may be individual profit maximisation or, alternatively, joint profit maximisation. Entry may be impossible, so that an industry is composed of a fixed number of firms, it may be unhindered or incumbent firms may be following a policy of entry deterrence. To avoid some of this complexity, this chapter will focus primarily upon economies with quantity setting oligopoly and homogeneous products although at some points conjectures are introduced to permit flexibility. For a suitable choice of conjecture, this form of oligopoly has the advantage of being equivalent to monopoly when the industry has a single firm and, under most circumstances, to competition as the number of firms increases without limit. This makes the economy both straightforward and flexible.

A second point of some relevance is that tax incidence is more complex with imperfect competition. Under the competitive assumption any taxes are simply passed forward by the firms since price is always set at marginal cost. In contrast, prices on imperfectly competitive markets are set at a level above marginal cost and an increase in cost due to taxation need not be reflected in an identical increase in price. To determine the actual change it is necessary to work through

the comparative statics of the industry in question. In addition to the price effects, imperfectly competitive firms may also earn non-zero profits and the effect of taxation on these must also be determined.

The initial sections of this chapter focus on issues related to the construction and analysis of a general equilibrium economy with imperfect competition. After introducing the economy that forms the basis of the chapter, it is shown why the equilibrium is not Pareto optimal and measures of the welfare loss due to imperfect competition are described. This is followed by an analysis of commodity tax incidence and optimal tax rules. The chapter is completed by a reconsideration of the necessity for production efficiency.

8.2 Imperfect competition and general equilibrium

The first formal general equilibrium economy with imperfect competition can be attributed to Negishi (1961). Also of significance are Arrow and Hahn (1971), Gabszewicz and Vial (1972), Roberts and Sonnenschein (1977), Cornwall (1977) and the survey by Hart (1985). Unlike the Arrow-Debreu formulation of the competitive economy there is not a single, generally accepted framework but a number of alternative specifications. The economies are differentiated by the assumptions made about the form of demand function known by the firms and on the relation of demand to profit.

8.2.1 Objective and subjective demand

The first distinction to note is between economies that employ objective demands and those using subjective demands. This distinction arises from the information that the firms comprising an imperfectly competitive industry must possess in order to know their profit function. In a competitive economy, a firm need only observe the set of market prices to determine its profit maximising strategy. In contrast an imperfectly competitive firm requires the knowledge of the demand function for its product. Naturally this is a far greater informational requirement than just the knowledge of prices and, when literally interpreted, implies that the firms need to be able to solve the economy to generate the excess demands.

Faced with this informational problem, Negishi (1961) assumed that the firms actually knew only a linear approximation to their true demand functions, with the restriction that the linear approximation was equal to the true demand at equilibrium prices. The latter condition ensures that the firms generate the profit levels that they were expecting. Such demands have been labeled subjective since they exist only as beliefs held by firms. This approach has been extended by Gary-Bobo (1989) to consider firms that perceive knowledge of a k^{th} order Taylor expansion of their true demand. When k = 1 the equilibria coincide with the equilibrium arising from the true demands.

In an economy with objective demand, such as Gabszewicz and Vial (1972), it is assumed that the firms actually know their demand functions. Despite the informational burden this imposes, it does overcome the problems of the subjective approach in that it does not require specification of how the firms form the subjective demands or of how they may seek to revise them. In the analysis of this chapter only the objective approach is followed. This can be supported on the grounds of simplicity and the fact that since subjective demands are typically chosen equal to objective demands at equilibrium, the equilibrium of the economy should not be affected by the choice.

The assumptions concerning the distribution of profits and their effect upon demand is another area in which alternative economies differ. If returned to consumers as dividends, whenever income effects are non-zero a firm's profits must appear as an argument of its demand function. This causes some difficulties for the specification of the firm's maximisation problem since the quantity to be maximised (profit) appears as an argument in the objective function. When this occurs, standard results on maximisation are not applicable.

There have been three responses to this. The first is to assume the structure of the economy is such that there are no income effects. This approach is exemplified by the work of Hart (1982) in which the economy is divided into separate sectors and the firms distribute profit generated in one sector to consumers who purchase in a different sector. In this way, although aggregate

demand depends on profit, the demand for each firm is independent of its own profit level. However, assumptions such as this have the disadvantage of being highly artificial.
The second response is more direct and simply involves assuming that all profits are taxed at a rate of 100% so that profit income accrues to the government alone. This assumption has the disadvantage of eliminating the motive for the choice of profit maximising strategy for the firms. The final approach is to meet the problem directly and to extend the analysis to suit. This has the drawback of leading to greater complication in the results. The approach taken below will be to adopt a combination of the latter two possibilities, with the choice made to suit the purpose.

To complete this discussion of the choice of structure, it should be noted that intermediate goods are almost never included in general equilibrium economies with imperfect competition. This exclusion is due to the difficulty of formulating the derived demand for such goods when a number of firms have market power.
For a discussion of this point, see Hart (1985). Although they are similarly excluded from most of the discussion below, they do occur at two points: in the discussion of the extent of welfare loss due to imperfect competition and in the treatment of production efficiency.

8.3 Imperfect competition and welfare

Imperfect competition is one of the standard examples of market failure which lead to the non-achievement of Pareto optimality. It is on this basis that economic policy is usually suggested as necessary in the presence of imperfect competition in order to reduce inefficiency.
The aims of competition (anti-trust) laws are to ensure that consumers pay the lowest possible price (=the most efficient price) coupled with the highest quality of the goods and services which they consume. This, according to current economic theories, can be achieved only through effective competition. Competition not only reduces particular prices of specific goods and services - it also tends to have a deflationary effect by reducing the general price level. It pits consumers against producers, producers against other producers (in the battle to win the heart of consumers) and even consumers against consumers (for example in the healthcare sector in the USA). This everlasting conflict does the miracle of increasing quality with lower prices. Think

about the vast improvement on both scores in electrical appliances. The VCR and PC of yesteryear cost thrice as much and provided one third the functions at one tenth the speed.

Competition has innumerable advantages:

It encourages manufacturers and service providers to be more efficient, to better respond to the needs of their customers, to innovate, to initiate, to venture. In professional words: it optimizes the allocation of resources at the firm level and, as a result, throughout the national economy. More simply: producers do not waste resources (capital), consumers and businesses pay less for the same goods and services and, as a result, consumption grows to the benefit of all involved.

The other beneficial effect seems, at first sight, to be an adverse one: competition weeds out the failures, the incompetents, the inefficient, the fat and slow to respond. Competitors pressure one another to be more efficient, leaner and meaner. This is the very essence of capitalism. It is wrong to say that only the consumer benefits. If a firm improves itself, re-engineers its production processes, introduces new management techniques, modernizes - in order to fight the competition, it stands to reason that it will reap the rewards. Competition benefits the economy, as a whole, the consumers and other producers by a process of natural economic selection where only the fittest survive. Those who are not fit to survive die out and cease to waste the rare resources of humanity.

Thus, paradoxically, the poorer the country, the less resources it has - the more it is in need of competition. Only competition can secure the proper and most efficient use of its scarce resources, a maximization of its output and the maximal welfare of its citizens (consumers). Moreover, we tend to forget that the biggest consumers are businesses (firms). If the local phone company is inefficient (because no one competes with it, being a monopoly) - firms will suffer the most: higher charges, bad connections, lost time, effort, money and business. If the banks are dysfunctional (because there is no foreign competition), they will not properly service their clients and firms will collapse because of lack of liquidity. It is the business sector in poor countries which should head the crusade to open the country to competition.

Unfortunately, the first discernible results of the introduction of free marketer are unemployment and business closures. People and firms lack the vision, the knowledge and the wherewithal

needed to support competition. They fiercely oppose it and governments throughout the world bow to protectionist measures. To no avail, closing a country to competition will only exacerbate the very conditions which necessitate its opening up. At the end of such a wrong path awaits economic disaster and the forced entry of competitors. A country which closes itself to the world - will be forced to sell itself cheaply as its economy will become more and more inefficient, less and less non-competitive.

The Competition Laws aim to establish fairness of commercial conduct among entrepreneurs and competitors which are the sources of said competition and innovation.

Experience - later buttressed by research - helped to establish the following four principles:

There should be no barriers to the entry of new market players (barring criminal and moral barriers to certain types of activities and to certain goods and services offered)

A larger scale of operation does introduce economies of scale (and thus lowers prices). This, however, is not infinitely true. There is a Minimum Efficient Scale - MES - beyond which prices will begin to rise due to monopolization of the markets. This MES was empirically fixed at 10% of the market in any one good or service. In other words: companies should be encouraged to capture up to 10% of their market (=to lower prices) and discouraged to cross this barrier, lest prices tend to rise again.

Efficient competition does not exist when a market is controlled by less than 10 firms with big size differences. An oligopoly should be declared whenever 4 firms control more than 40% of the market and the biggest of them controls more than 12% of it.

A competitive price will be comprised of a minimal cost plus an equilibrium profit which does not encourage either an exit of firms (because it is too low), nor their entry (because it is too high).

Left to their own devices, firms tend to liquidate competitors (predation), buy them out or collude with them to raise prices. The 1890 Sherman Antitrust Act in the USA forbade the latter (section 1) and prohibited monopolization or dumping as a method to eliminate competitors. Later acts (Clayton, 1914 and the Federal Trade Commission Act of the same year) added forbidden activities: tying arrangements, boycotts, territorial divisions, non-competitive mergers,

price discrimination, exclusive dealing, unfair acts, practices and methods. Both consumers and producers who felt offended were given access to the Justice Department and to the FTC or the right to sue in a federal court and be eligible to receive treble damages.

It is only fair to mention the "intellectual competition", which opposes the above premises. Many important economists thought (and still do) that competition laws represent an unwarranted and harmful intervention of the State in the markets. Some believed that the State should own important industries (J.K. Galbraith), others - that industries should be encouraged to grow because only size guarantees survival, lower prices and innovation (Ellis Hawley). Yet others supported the cause of laissez faire (Marc Eisner).

These three antithetical approaches are, by no means, new. One led to socialism and communism, the other to corporatism and monopolies and the third to jungle-ization of the market (what the Europeans derisively call: the Anglo-Saxon model).

B. HISTORICAL AND LEGAL CONSIDERATIONS

Why does the State involve itself in the machinations of the free market? Because often markets fail or are unable or unwilling to provide goods, services, or competition. The purpose of competition laws is to secure a competitive marketplace and thus protect the consumer from unfair, anti-competitive practices. The latter tend to increase prices and reduce the availability and quality of goods and services offered to the consumer.

Such state intervention is usually done by establishing a governmental Authority with full powers to regulate the markets and ensure their fairness and accessibility to new entrants. Lately, international collaboration between such authorities yielded a measure of harmonization and coordinated action (especially in cases of trusts which are the results of mergers and acquisitions).

Yet, competition law embodies an inherent conflict: while protecting local consumers from monopolies, cartels and oligopolies - it ignores the very same practices when directed at foreign

consumers. Cartels related to the country's foreign trade are allowed even under GATT/WTO rules (in cases of dumping or excessive export subsidies). Put simply: governments regard acts which are criminal as legal if they are directed at foreign consumers or are part of the process of foreign trade.

A country such as Macedonia - poor and in need of establishing its export sector - should include in its competition law at least two protective measures against these discriminatory practices:

Blocking Statutes - which prohibit its legal entities from collaborating with legal procedures in other countries to the extent that this collaboration adversely affects the local export industry.
Claw back Provisions - which will enable the local courts to order the refund of any penalty payment decreed or imposed by a foreign court on a local legal entity and which exceeds actual damage inflicted by unfair trade practices of said local legal entity. US courts, for instance, are allowed to impose treble damages on infringing foreign entities. The claw back provisions are used to battle this judicial aggression.
Competition policy is the antithesis of industrial policy. The former wishes to ensure the conditions and the rules of the game - the latter to recruit the players, train them and win the game. The origin of the former is in the 19th century USA and from there it spread to (really was imposed on) Germany and Japan, the defeated countries in the 2nd World War. The European Community (EC) incorporated a competition policy in articles 85 and 86 of the Rome Convention and in Regulation 17 of the Council of Ministers, 1962.

Still, the two most important economic blocks of our time have different goals in mind when implementing competition policies. The USA is more interested in economic (and econometric) results while the EU emphasizes social, regional development and political consequences. The EU also protects the rights of small businesses more vigorously and, to some extent, sacrifices intellectual property rights on the altar of fairness and the free movement of goods and services.

Put differently: the USA protects the producers and the EU shields the consumer. The USA is interested in the maximization of output at whatever social cost - the EU is interested in the

creation of a just society, a livable community, even if the economic results will be less than optimal.

There is little doubt that Macedonia should follow the EU example. Geographically, it is a part of Europe and, one day, will be integrated in the EU. It is socially sensitive, export oriented, its economy is negligible and its consumers are poor, it is besieged by monopolies and oligopolies.

In my view, its competition laws should already incorporate the important elements of the EU (Community) legislation and even explicitly state so in the preamble to the law. Other, mightier, countries have done so. Italy, for instance, modeled its Law number 287 dated 10/10/90 "Competition and Fair Trading Act" after the EC legislation. The law explicitly says so.

The first serious attempt at international harmonization of national antitrust laws was the Havana Charter of 1947. It called for the creation of an umbrella operating organization (the International Trade Organization or "ITO") and incorporated an extensive body of universal antitrust rules in nine of its articles. Members were required to "prevent business practices affecting international trade which restrained competition, limited access to markets, or fostered monopolistic control whenever such practices had harmful effects on the expansion of production or trade". The latter included:

Fixing prices, terms, or conditions to be observed in dealing with others in the purchase, sale, or lease of any product;
Excluding enterprises from, or allocating or dividing, any territorial market or field of business activity, or allocating customers, or fixing sales quotas or purchase quotas;
Discriminating against particular enterprises;
Limiting production or fixing production quotas;
Preventing by agreement the development or application of technology or invention, whether patented or non-patented; and
Extending the use of rights under intellectual property protections to matters which according to a member's laws and regulations, are not within the scope of such grants, or to products or conditions of production, use, or sale which are not likewise the subject of such grants.

GATT 1947 was a mere bridging agreement but the Havana Charter languished and died due to the objections of a protectionist US Senate.

There are no antitrust/competition rules either in GATT 1947 or in GATT/WTO 1994, but their provisions on antidumping and countervailing duty actions and government subsidies constitute some elements of a more general antitrust/competition law.

GATT, though, has an International Antitrust Code Writing Group which produced a "Draft International Antitrust Code" (10/7/93). It is reprinted in §II, 64 Antitrust & Trade Regulation Reporter (BNA), Special Supplement at S-3 (19/8/93).

Four principles guided the (mostly German) authors:

A minimum standard for national antitrust rules should be set (stricter measures would be welcome); and
The establishment of an international authority to settle disputes between parties over antitrust issues.
The 29 (well-off) members of the Organization for Economic Cooperation and Development (OECD) formed rules governing the harmonization and coordination of international antitrust/competition regulation among its member nations ("The Revised Recommendation of the OECD Council Concerning Cooperation between Member Countries on Restrictive Business Practices Affecting International Trade," OECD Doc. No. C(86)44 (Final) (June 5, 1986), also in 25 International Legal Materials 1629 (1986). A revised version was reissued. According to it, "Enterprises should refrain from abuses of a dominant market position; permit purchasers, distributors, and suppliers to freely conduct their businesses; refrain from cartels or restrictive agreements; and consult and cooperate with competent authorities of interested countries".

An agency in one of the member countries tackling an antitrust case, usually notifies another member country whenever an antitrust enforcement action may affect important interests of that country or its nationals (see: OECD Recommendations on Predatory Pricing, 1989).

The United States has bilateral antitrust agreements with Australia, Canada, and Germany, which was followed by a bilateral agreement with the EU in 1991. These provide for coordinated antitrust investigations and prosecutions. The United States thus reduced the legal and political obstacles which faced its extraterritorial prosecutions and enforcement. The agreements require one party to notify the other of imminent antitrust actions, to share relevant information, and to consult on potential policy changes. The EU-U.S. Agreement contains a "comity" principle under which each side promises to take into consideration the other's interests when considering antitrust prosecutions. A similar principle is at the basis of Chapter 15 of the North American Free Trade Agreement (NAFTA) - cooperation on antitrust matters.

The United Nations Conference on Restrictive Business Practices adopted a code of conduct in 1979/1980 that was later integrated as a U.N. General Assembly Resolution [U.N. Doc. TD/RBP/10 (1980)]: "The Set of Multilaterally Agreed Equitable Principles and Rules".

According to its provisions, "independent enterprises should refrain from certain practices when they would

C. ANTI - COMPETITIVE STRATEGIES

Any Competition Law in Macedonia should, in my view, explicitly include strict prohibitions of the following practices (further details can be found in Porter's book - "Competitive Strategy"). These practices characterize the Macedonian market. They influence the Macedonian economy by discouraging foreign investors, encouraging inefficiencies and mismanagement, sustaining artificially high prices, misallocating very scarce resources, increasing unemployment, fostering corrupt and criminal practices and, in general, preventing the growth that Macedonia could have attained.

Exclude competitors from distribution channels - this is common practice in many countries. Open threats are made by the manufacturers of popular products: "If you distribute my competitor's products - you cannot distribute mine. So, choose." Naturally, retail outlets, dealers

and distributors will always prefer the popular product to the new. This practice not only blocks competition - but also innovation, trade and choice or variety.

Buy up competitors and potential competitors - There is nothing wrong with that. Under certain circumstances, this is even desirable. Think about the Banking System: it is always better to have fewer banks with bigger capital than many small banks with capital inadequacy (remember the TAT affair). So, consolidation is sometimes welcome, especially where scale represents viability and a higher degree of consumer protection. The line is thin and is composed of both quantitative and qualitative criteria. One way to measure the desirability of such mergers and acquisitions (M&A) is the level of market concentration following the M&A. Is a new monopoly created? Will the new entity be able to set prices unperturbed? Stamp out its other competitors? If so, it is not desirable and should be prevented.

Every merger in the USA must be approved by the antitrust authorities. When multinationals merge, they must get the approval of all the competition authorities in all the territories in which they operate. The purchase of "Intuit" by "Microsoft" was prevented by the antitrust department (the "Trust-busters"). A host of airlines was conducting a drawn out battle with competition authorities in the EU, UK and the USA lately.

Use predatory [below-cost] pricing (also known as dumping) to eliminate competitors - This tactic is mostly used by manufacturers in developing or emerging economies and in Japan. It consists of "pricing the competition out of the markets". The predator sells his products at a price which is lower even than the costs of production. The result is that he swamps the market, driving out all other competitors. Once he is left alone - he raises his prices back to normal and, often, above normal. The dumper loses money in the dumping operation and compensates for these losses by charging inflated prices after having the competition eliminated.

Raise scale-economy barriers - Take unfair advantage of size and the resulting scale economies to force conditions upon the competition or upon the distribution channels. In many countries Big Industry lobbies for a legislation which will fit its purposes and exclude its (smaller) competitors.

Increase "market power (share) and hence profit potential". Study the industry's "potential" structure and ways it can be made less competitive - Even thinking about sin or planning it should be prohibited. Many industries have "think tanks" and experts whose sole function is to show the firm the way to minimize competition and to increase its market shares. Admittedly, the line is very thin: when does a Marketing Plan become criminal?

Arrange for a "rise in entry barriers to block later entrants" and "inflict losses on the entrant" - This could be done by imposing bureaucratic obstacles (of licensing, permits and taxation), scale hindrances (no possibility to distribute small quantities), "old boy networks" which share political clout and research and development, using intellectual property right to block new entrants and other methods too numerous to recount. An effective law should block any action which prevents new entry to a market.

Buy up firms in other industries "as a base from which to change industry structures" there - This is a way of securing exclusive sources of supply of raw materials, services and complementing products. If a company owns its suppliers and they are single or almost single sources of supply - in effect it has monopolized the market. If a software company owns another software company with a product which can be incorporated in its own products - and the two have substantial market shares in their markets - then their dominant positions will reinforce each other's.

"Find ways to encourage particular competitors out of the industry" - If you can't intimidate your competitors you might wish to "make them an offer that they cannot refuse". One way is to buy them, to bribe out the key personnel, to offer tempting opportunities in other markets, to swap markets (I will give my market share in a market which I do not really care about and you will give me your market share in a market in which we are competitors). Other ways are to give the competitors assets, distribution channels and so on providing that they collude in a cartel.

"Send signals to encourage competition to exit" the industry - Such signals could be threats, promises, policy measures, attacks on the integrity and quality of the competitor, announcement that the company has set a certain market share as its goal (and will, therefore, not tolerate

anyone trying to prevent it from attaining this market share) and any action which directly or indirectly intimidates or convinces competitors to leave the industry. Such an action need not be positive - it can be negative, need not be done by the company - can be done by its political proxies, need not be planned - could be accidental. The results are what matters.

Raise "mobility" barriers to keep competitors in the least-profitable segments of the industry - This is a tactic which preserves the appearance of competition while subverting it. Certain, usually less profitable or too small to be of interest, or with dim growth prospects, or which are likely to be opened to fierce domestic and foreign competition are left to the competition. The more lucrative parts of the markets are zealously guarded by the company. Through legislation, policy measures, withholding of technology and know-how - the firm prevents its competitors from crossing the river into its protected turf.

Let little firms "develop" an industry and then come in and take it over - This is precisely what Netscape is saying that Microsoft is doing to it. Netscape developed the now lucrative Browser Application market. Microsoft was wrong in discarding the Internet as a fad. When it was found to be wrong - Microsoft reversed its position and came up with its own (then, technologically inferior) browser (the Internet Explorer). It offered it free (sound suspiciously like dumping) to buyers of its operating system, "Windows". Inevitably it captured more than 30% of the market, crowding out Netscape. It is the view of the antitrust authorities in the USA that Microsoft utilized its dominant position in one market (that of the Operating Systems) to annihilate a competitor in another (that of the browsers).

Engage in "promotional warfare" by "attacking shares of others" - This is when the gist of a marketing or advertising campaign is to capture the market share of the competition. Direct attack is then made on the competition just in order to abolish it. To sell more in order to maximize profits, is allowed and meritorious - to sell more in order to eliminate the competition is wrong and should be disallowed.

Use price retaliation to "discipline" competitors - Through dumping or even unreasonable and excessive discounting. This could be achieved not only through the price itself. An exceedingly

long credit term offered to a distributor or to a buyer is a way of reducing the price. The same applies to sales, promotions, vouchers, gifts. They are all ways to reduce the effective price. The customer calculates the money value of these benefits and deducts them from the price.

Establish a "pattern" of severe retaliation against challengers to "communicate commitment" to resist efforts to win market share - Again, this retaliation can take a myriad of forms: malicious advertising, a media campaign, adverse legislation, blocking distribution channels, staging a hostile bid in the stock exchange just in order to disrupt the proper and orderly management of the competitor. Anything which derails the competitor whenever he makes headway, gains a larger market share, and launches a new product - can be construed as a "pattern of retaliation".

Create or encourage capital scarcity - by colluding with sources of financing (e.g., regional, national, or investment banks), by absorbing any capital offered by the State, by the capital markets, through the banks, by spreading malicious news which serve to lower the credit-worthiness of the competition, by legislating special tax and financing loopholes and so on.

Introduce high advertising-intensity - This is very difficult to measure. There could be no objective criteria which will not go against the grain of the fundamental right to freedom of expression. However, truth in advertising should be strictly imposed. Practices such as dragging a competitor through the mud or derogatorily referring to its products or services in advertising campaigns should be banned and the ban should be enforced.

Proliferate "brand names" to make it too expensive for small firms to grow - By creating and maintaining a host of absolutely unnecessary brand names, the competition's brand names are crowded out. Again, this cannot be legislated against. A firm has the right to create and maintain as many brand names as it wishes. The market will exact a price and thus punish such a company because, ultimately, its own brand name will suffer from the proliferation.

Create "switching" costs - Through legislation, bureaucracy, control of the media, cornering advertising space in the media, controlling infrastructure, owning intellectual property, owning, controlling or intimidating distribution channels and suppliers and so on. Impose vertical "price

squeezes" - By owning, controlling, colluding with, or intimidating suppliers and distributors, marketing channels and wholesale and retail outlets into not collaborating with the competition.

This has the following effects:

The firm gains a "tap (access) into technology" and marketing information in an adjacent industry. It defends itself against a supplier's too-high or even realistic prices. It defends itself against foreclosure, bankruptcy and restructuring or reorganization. Owning suppliers means that the supplies do not cease even when payment is not affected, for instance.

It "protects proprietary information from suppliers" - otherwise the firm might have to give outsiders access to its technology, processes, formulas and other intellectual property. It raises entry and mobility barriers against competitors. This is why the State should legislate and act against any purchase, or other types of control of suppliers and marketing channels which service competitors and thus enhance competition.

This argument is highly successful with US federal courts in the last decade. There is an intuitive feeling that few is better and that a consolidated industry is bound to be more efficient, better able to compete and to survive and, ultimately, better positioned to lower prices, to conduct costly research and development and to increase quality. In the words of Porter: "(The) pay-off to consolidating a fragmented industry can be high because... small and weak competitors offer little threat of retaliation" Time one's own capacity additions; never sell old capacity "to anyone who will use it in the same industry" and buy out "and retire competitors' capacity."

8.4 Measures of welfare loss

It has been shown that the imperfectly competitive equilibrium is not Pareto optimal. Following from this, the equilibrium cannot maximize the value of any social welfare function that satisfies the Pareto criterion. This observation then makes it natural to consider what the degree of welfare loss may actually be, either for a real economy or for simulated examples. The

assessment of monopoly welfare loss has been a subject of some dispute in which calculations have provided a range of estimates from the effectively insignificant to considerable percentages of potential welfare.

Contributions to the literature on monopoly welfare loss can be characterised according to three criteria: the welfare measure used; whether data or simulations are employed and whether the underlying model is of general or partial equilibrium. The choice between welfare measures can effectively be reduced to either calculating welfare loss triangles (in terms of National Income in Harberger (1954) and Gross Corporate Product in Cowling and Mueller (1978)) or specifying an explicit welfare function and using this to evaluate welfare loss, a methodology whose case has been argued most forcefully by Bergson (1973).

8.5 Conclusions

This chapter has shown how imperfect competition leads to a failure to attain Pareto optimality. As with all such failures, this opens a potential role for government intervention to promote efficiency. Estimates of the welfare loss due to imperfect competition have been constructed from both observed data and from numerical simulations. These vary widely from the almost insignificant to considerable proportions of attained welfare. On balance, it is likely, however, that imperfect competition is of significance.

There are numerous ways in which imperfect competition can be represented. The subjective and objective demand approaches were discussed and a number of unresolved issues were highlighted. An economy incorporating quantity setting oligopoly using objective demand, and conjectural variations when interesting, was then adopted and it was shown how this could be employed to determine the structure of optimal commodity taxation. The tax rules derived were direct generalizations of those for the competitive economy and their implementation would require information additional to the competitive rules.

In contrast to the competitive case, specific and ad valorem taxation are not equivalent with imperfect competition. In a choice between the instruments, ad valorem taxation is more

effective since it has the effect of reducing perceived monopoly power. Combining the instruments can lead to further gains and, if correctly chosen, the welfare loss due to the monopoly power can be eliminated entirely finally, imperfect competition was also shown to invalidate the general argument for production efficiency, so that taxes on intermediate goods could be justified.

CHAPTER 9
Tax Evasion

9.1 Introduction

An implicit assumption that supported the analysis of taxation in the previous chapters was that firms and consumers honestly report their taxable activities. Although acceptable for providing simplified insights into the underlying issues, this assumption is patently unacceptable when confronted with reality. The purpose of this chapter can therefore be seen as the introduction of practical constraints upon the free choice of tax policy. Tax evasion, the intentional failure to declare taxable economic activity, is pervasive in many economies as the evidence given in the following section makes clear and is therefore a subject of practical as well as theoretical interest.

After reviewing evidence on the extent of tax evasion, the chapter considers the tax evasion decision of consumers. This decision is represented as a choice under uncertainty and naturally employs the techniques. Within this framework, the optimal degree of auditing and of punishment is considered. This is then extended to include decisions over labour supply, since the choice of occupation can determine opportunities for evasion, and the role of public goods and social norms. The analysis predicts the relationship between the level of evasion, tax rates and punishments. The results of experiments that investigate these are discussed. A more developed analysis of the optimal choice of audit is then given. The analysis of tax evasion is then completed by consideration of evasion by firms.

9.2 The extent of tax evasion

The importance of developing a theoretical understanding of tax evasion can only be assessed by estimating the actual extent of evasion. If such evasion constitutes a significant activity within the economy, then a theory of evasion is of potential use in designing structures that minimize evasion at least cost and ensuring that policies are optimal given that evasion occurs.

Due to its very nature, the measurement of tax evasion and unreported economic activity is fraught with difficulty and uncertainty. Tax evasion should be distinguished from tax avoidance, which is the reorganisation of economic activity, possibly at some cost, to lower tax payment. Tax avoidance is legal, tax evasion is not. This illegality makes surveys prone to error if the fear of prosecution remains and, by definition, tax evasion is not measured in official statistics. The estimates reported below therefore rely on a number of methods of inference which naturally leaves them open to error. They should be regarded primarily as rough approximations. In addition to measurement errors, there is also the issue of what should be included. Illegal activities, such as the supply of drugs or smuggling generally, would not be included in measured GDP even if they were known. It is open to debate as to whether they should be included in measures of the hidden economy.

One of the earliest published studies of tax evasion is the analysis by Rey (1965) of the Italian General Sales Tax. This tax is levied on all exchanges of goods and services, with some exceptions, and in 1961 raised revenue equal to approximately 4% of GNP. The tax had several methods of collection and of the largest of these, which raised two thirds of revenue; Rey estimated that evasion was equal to 52.46% of actual yield. This is clearly a significant degree of evasion.

In an article that proved the starting point for many studies, Gutmann (1977) attempted to measure the extent of unobserved economic activity, or the hidden economy, in the USA. Based on the observation that transactions in the hidden economy are invariably financed by cash rather than cheque or credit, Gutmann used the growth of currency in circulation relative to demand deposits as an indirect measure of unobserved activity. This procedure resulted in an estimate of $176 bn. for illegal GNP in 1976 which was approximately 10% of legal, measured activity. This figure is in accordance with that reported by the Internal Revenue Service in 1979 which estimated unreported income in 1976 to be between $75 bn. and $100 bn. or 7% to 9% of reported income. Feige (1979) attempted to measure the same activity as Gutmann but employing a different methodology. The method of Feige was to work from the observation that total economic activity, including both measured and unmeasured sectors, is equal to the price level times transactions. An estimate of the unmeasured sector is then provided by the ratio of

the value of measured income to that of transactions. The major difficulty with this approach is determining the number of transactions that actually occur. Feige achieved this by using data on the life-span in months of bank notes in circulation relative to the number of times it is expected each note can be used. This analysis provides an estimate of the unmeasured sector in 1976 of $369 bn., which is 22% of GNP, and $704 bn., 33%, in 1978. Given the size of these estimates, Feige concludes that official statistics must be very misleading.

Even when the possible degrees of error are taken into account, the impression that these estimates give is that undeclared economic activity, and hence tax evasion, is a significant part of total economic activity in many western economies. Although the methods employed are imperfect, they cannot be dismissed entirely. Such an observation clearly justifies further study of the causes and consequences of tax evasion.

To close this section, it is worth noting that implicit in many discussions is the assumption that tax evasion reduces tax revenue. However, as shown by Peacock and Shaw (1982), if unreported activity has a multiplier effect and would take place at a lower level if it were subject to taxation, then estimates of revenue loss will be overstated, even to the extent that evasion may lead to no revenue loss at all. This effect is enhanced by the possibility that evasion may encourage participation in taxed activities. As the analysis of Peacock and Shaw is based on a simple Keynesian model, this is a point that could bear further investigation.

9.3 Evasion as a decision with risk

The decision to evade taxation fits naturally into the framework of choice under risk. Since not all tax evaders are caught by the tax authorities, risk arises since an individual who evades tax stands a chance of succeeding with the evasion, and hence having increased wealth, or a chance of being caught and punished. As an initial approximation, the individual can be viewed as choosing the extent of tax to evade, subject to the probability of being caught and punished, to maximize expected utility. The earliest formal analyses of this decision were given by Allingham and Sandmo (1972), Srinivasan (1973) and Yitzhaki (1974). These differ only in the structure of the punishments and that Srinivasan imposes risk neutrality by assuming the

individual's objection is the maximisation of expected income. The derivation given below will be based primarily upon Yitzhaki. A diagrammatic presentation can be found in Cowell (1985a).

The tax-payer receives an exogeneous income M which is known to the taxpayer but not to the tax collector. The analysis is simplified by assuming that declared income, X, is taxed at a constant rate t. If the taxpayer is caught evading, which occurs with probability p, a fine $F > 1$ is placed upon evaded tax.

9.4 Optimal auditing and punishment

In developing the comparative statics properties of the tax evasion decision, it has been assumed that the probability of detection, or of auditing, and the fine levied when detected are constant. This is correct from the viewpoint of the tax evader but from the perspective of the tax collector they are variables which can be chosen to attain specified objectives. The present section will consider the choice of these variables within the simplest framework; an alternative perspective.

It is now possible to consider the determination of the optimal values of p and F. A natural assumption is that detection is costly in the sense that resources are used in the auditing procedure. Thus increases in p require additional expenditure. In contrast, there are no differences in the cost of alternative levels of F and, effectively, increases in F are costless to produce. Given this, it is clear what the optimal, revenue-maximising combination of p and F should be: p should be set to zero and F increased without limit. This structure provides maximum deterrence at zero cost. In the words of Kolm (1973), the optimal policy should be to hang tax evaders with probability zero. This result is also supported by the analysis of Christiansen (1980) which shows, with a slightly different specification, that when the detection probability and the fine are adjusted to keep the expected gain from tax evasion constant, tax evasion will be reduced by an increase in the fine so that the fine is the more efficient deterrent. Further development of this result, introducing non-proportional taxes, can be found in Koskela (1983).

There are several comments that can be made in respect of this result. Firstly, it has been assumed that the aim of the tax collector was to choose the probability and the fine in order to maximize tax revenue. This runs in contrast to the position of previous chapters in which social welfare is maximised subject to a revenue constraint. If this latter viewpoint is accepted in the present context and the set of choice variables extended to also include the tax rate, then an interior solution may exist. This will be considered when public good are introduced. Secondly, the level of the fine may not be under the direct control of the tax collector but may be determined by the courts relative to punishments for other crimes. In this case, the only choice variable is the probability of detection and if detection is costly an interior solution is again likely to exist. Finally, if a majority of the population are evading taxation, there is little public support for strong enforcement since each consumer may perceive the threat of punishment to outweigh any gains that may accrue from additional tax revenue.

This section has considered the determination of the optimal values of detection probability and fine within a tax-revenue maximisation context and in this particular case the optimum involved zero detection and maximal punishment.

This result should be contrasted to those of later sections in which the structure is somewhat modified.

9.5 Tax evasion and labour supply

The labour supply decision with evasion has two important components. Firstly, there is the question of how the possibility for evasion and non-declaration of income affects the labour supply decision in terms of the comparative statics of labour supply. Secondly, there is also the issue of occupational choice. If some forms of employment have greater possibilities for evasion than others, then each household must reach a decision on the quantity of each form of employment to be undertaken. The tax system and the punishments for evasion will clearly have an influence upon this decision.

9.5.1 Allocation of hours

It has been assumed above that tax evasion takes the form of a simple failure to declare some of the income earned. In practice tax evasion is also linked to occupational choice, with some occupations providing greater opportunities for evasion than others. Furthermore, within an occupation it may also possible to divide labour time between an official market, the income from which must be declared, and an unofficial market from which the income earned is not declared. It is upon this latter aspect that the focus will now be placed.

9.6 Public goods

When the objective of the policy maker is revenue maximisation, it was shown above that the optimal choice of detection probability and fine was to have infinite punishment with zero probability of detection. The reason for the optimality of this extreme strategy was that the objective function did not take account of the welfare of the taxpayers nor the use to which the revenue would be put. Once these are incorporated, the choice problem has more content. The simplest means by which to close the system is to assume that tax revenue is used to supply a public good from which all households derive welfare.

This provides the motivation for the existence of taxation. In addition to this, it is also necessary to include a cost function for the detection probability, reflecting the fact that catching tax evaders requires the input of resources. Combining these features with a suitable welfare function then provides a well-specified maximisation problem.

The specification of the welfare function raises some interesting issues in this context. Since the government, whose preferences are captured by the social welfare function, would prefer all taxpayers to act honestly and does not hesitate to punish those who do not, should it take account of the welfare of evaders when formulating policy? Since tax evasion is only a minor crime it may seem that tax evaders should not be excluded from consideration by society. However, this cannot be claimed to constitute a general proposition about all crimes since there probably reaches a point where a crime is so heinous that its perpetrator does not merit attention in the formulation of society's preferences. Although there is no clear set of guidelines to answer this question, the tradition in the literature, for instance Kolm (1973) and Sandmo (1981), has been to

adopt a utilitarian framework in which the utilities of evaders are included in social welfare. This is probably for analytical simplicity rather than for philosophical reasons.

9.7 Empirical evidence

The theoretical analysis of tax evasion has predicted the effect that changes in various parameters will have upon the level of tax evasion. In some cases, such as the effect of the probability of detection and the fine, these are unambiguous. In others, particularly the effect of changes in the tax rate, the effects depend upon the precise specification of the tax system and upon assumptions concerning attitudes towards risk. Given these uncertainties, it is valuable to investigate empirical evidence in order to see how the ambiguities are resolved in practice.
Furthermore, analysis of empirical evidence also allows the investigation of the relevance of other parameters, such as source of income, and other hypotheses on tax evasion, for example the importance of social norms.

There have been three basic approaches taken in studying tax evasion. The first has been to collect survey or interview data and from this to infer the extent of evasion and some qualitative aspects of its relationship to various parameters.

Secondly, econometric analysis has been applied to both survey data and to standard economic statistics. Such analysis provides a more quantitative determination of the relationships. Finally, tax evasion experiments have been conducted which provide an opportunity of designing the environment to permit the investigation of particular hypotheses.

An early example of the use of interview data can be found in the study of Norwegian taxpayers by Mork (1975). The methodology was to interview individuals in order to ascertain their actual income levels. This information was then contrasted to that given on the tax returns of the same individuals and indicated a steady decline of declared income as a proportion of reported income as income rose. This result is in agreement with that of the comparative statics analysis.

Combining econometrics and survey methods, Spicer and Lundstedt (1976) sought to investigate the importance of attitudes and social norms in the evasion decision; the data were taken from a 1974 survey in the United States. Econometric analysis revealed that the propensity to evade taxation was reduced by an increased probability of detection and an increase in age. Surprisingly, and increase in income reduced the propensity to evade. With respect to the attitude and social variables, an increase in the perceived inequity of taxation and of the number of other tax evaders known to individual both made evasion more likely. The extent of tax evasion was also increased by the attitude and social variables but was also increased by the experience of the tax payer with previous tax audits. This study clearly demonstrated the importance of social variables in addition to the economic variables.

Turning now to experimental studies, Friedland, Maital and Rutenberg (1978) employed a tax evasion game in which participants were given a monthly income and a set of tax and punishment parameters. Given these, they were requested to make tax declarations. The major findings of this study were that evasion increased with the tax rate and, that keeping the net gain from evasion constant, evasion fell as the fine was increased and the detection probability reduced.

This result is in agreement with the theoretical analysis of Christiansen (1980). Further results showed that women evaded more often than men but evaded lower amounts and those purchasers of lottery tickets, presumed to be less risk averse, were no more likely to evade than non-purchasers but evaded greater amounts when they did evade. A similar experiment was conducted by Becker, Buchner and Sleeking (1987) but with the inclusion of endogenous transfers of tax revenue back to the taxpayers and with income being earned by the participants. With respect to the propensity to evade, a high transfer had a negative effect as did the probability of detection and, surprisingly, the perceived level of tax. Income level had a positive effect and hence raised the propensity to evade. Only the audit probability had a significant effect on the level of evasion.

The important lessons to be drawn from these results are that the theoretical predictions are generally supported, with the exception of the effect of the tax rate which remains uncertain, and

that tax evasion is rather more than a simple gamble; there are attitudinal and social aspects to the evasion decision. This latter observation naturally carries implications for further theoretical analysis of the evasion decision. In particular, the fact that some taxpayers never evade requires explanation.

9.8 Income taxation

Sandmo (1981) considers the determination of an optimal linear income tax in the presence of tax evasion. Taxpayers are divided into two groups. The first group consists of taxpayers who have a choice of allocating some, or all, of their labour to an unobserved sector and hence avoiding income tax. The second group of taxpayers does not have this option open to them and must pay tax upon all their earned income. An optimal income tax is then derived by maximising a utilitarian social welfare function. This resulting tax rule provides an implicit characterisation of the optimal marginal tax and can be partitioned into two parts: the first being the standard formula for the optimal marginal tax and the second being a correction term for the existence of tax evasion. If a higher tax rate leads to substitution towards labour in the unobserved sector then this makes the correction term positive and implies a tendency for the marginal rate of tax to be increased. This result is in marked contrast to the view that tax evasion should be offset by lower marginal rates of tax.

9.9 Summary

Tax evasion is an important and significant phenomenon that affects both developed and developing economies. Although there is residual uncertainty surrounding the accuracy of measurements, even the most conservative estimates suggest the hidden economy in the UK and US to be at least ten per cent of the measured economy. The substantial size of the hidden economy, and the tax evasion that accompanies it, requires understanding so that the effects of policies that interact with it can be correctly forecast.

The predictions of the standard Allingham-Sandmo representation of tax evasion as a choice with risk were derived and contrasted with empirical and experimental evidence. This showed

that although it is valuable as a starting point for a theory of evasion, the Allingham-Sandmo representation some key aspects of the evasion decision, most notably the effects of morals and the social interactions between taxpayers. In addition, tax evasion also impinges upon the broader issues of labour supply and the allocation of hours between markets and occupations. It was shown how each of these issues could be incorporated into the evasion decision.

CHAPTER 10
Overlapping Generations Economies

10.1 Introduction

The overlapping generations economy, so called because of its assumed demographic structure, was introduced by Samuelson (1958). It has since proved useful in many areas of economics including macroeconomic growth theory, public economics and monetary economics. One of the economy's major points of interest is the welfare properties of its equilibrium. Even when the standard competitive assumption are imposed, the equilibrium of the overlapping generations economy may not be Pareto optimal. This is in marked contrast to the Arrow-Debreu competitive economy.

Despite its value in many areas, as demonstrated by the previous chapters, there are several shortcomings of the Arrow-Debreu economy when applied to inter temporal issues. The first is that it is essentially static and, although it can be interpreted as inter temporal, this is not completely satisfactory. It would seem to be stretching the interpretation too far to accept trading in a single period for all goods into the indefinite future. Trades in the economy are carried out by barter and there is simply no role for money. This is a consequence of the assumptions that agents are assumed to know universally the terms of trade between commodities and that any sequence of transactions can be completed without cost or hindrance. The equilibrium of the economy is also Pareto optimal, so there can be no inefficiency in investment or in the choice of production techniques. Finally, the economy implicitly assumes the lives of each agent to be at least as long as the length of the economy itself. In many ways, the economy is simply too rich: it can cover all possibilities but can never describe anything in detail.

These observations provide the motivation for the study of overlapping generations economies. By structuring the evolution of the population and introducing time in a very real sense, the overlapping generations economy is able to address many issues of interest in public economics. The potential failure of its competitive equilibrium to be Pareto optimal provides an efficiency-based justification for assessing the benefits of government intervention. In addition to

possessing inefficient equilibria, overlapping generations economies can also generate cyclical equilibria without any requirement for exogenous shocks. Furthermore it is possible for fiat money to be valuable and for a continuum of equilibria to exist. All these features will be discussed below. This chapter sets out the structure of both the pure exchange overlapping generations economies and an aggregate economy with production due to Diamond (1965). A version of the economy proposed by Samuelson is introduced first, and the failure of efficiency demonstrated. The economy is then generalised and placed in an Arrow-Debreu format in order to make the comparison with the finite economy as sharp as possible. This generalised economy is employed to characterise efficient equilibria. Money, dynamics and indeterminacy are then considered. For the aggregate production economy, the focus is placed on characterising its steady state and the welfare properties of the steady state equilibrium.

10.2 Overlapping generation exchange economies

The features of the overlapping generations economy that have been noted above are most clearly identified in economies without production and it is these that have been most extensively analysed. For exchange economies it is straightforward to reinterpret an overlapping generations economy as a special case of the Arrow-Debreu economy described which the lifetime of each household is finite but, over the lifetime of the economy, there are an infinite number of households and goods. It is this double infinity that gives an overlapping generations economy its unique structure.

Following a general description of a typical overlapping generations economy, this section will demonstrate the failure of Pareto optimality in the simple economy first described by Samuelson (1958). Although instructive in itself, this style of presentation of the economy does not make clear the link between overlapping generations economies and the Arrow-Debreu economy. A more general economy is therefore introduced which is cast in a form that emphasises the parallels between it and the Arrow-Debreu economy. This general form of overlapping

generations economy is then employed to demonstrate the most important features of the equilibria of such economies.

An overlapping generations economy is explicitly inter temporal. Time is divided into discrete periods with the basic interval of time being equal to the length of time that elapses between the birth of one generation and that of the following generation. There is no final period for the economy. The population of households alive at any point in time in a typical overlapping generations economy consists of a set of finitely-lived consumers. At each date is born a cohort of young consumers and, if the rate of growth is positive, each cohort is larger than the previous. In this and the following chapters, the term household is reserved for a sequence of consumers linked by family ties. The lifespan of each consumer is assumed to be two periods; it will be shown below that this is not a significant restriction.

An equilibrium for the economy is a sequence of prices that equate demand to supply in each time period. In this section it is assumed that there is no production and no storage of commodities. Since the absence of storage possibilities prevents any of the endowment of one period being carried over to the next period, the supply in each period is equal to the fixed endowment. The existence of the infinite population makes the definition of a Pareto optimum non-trivial; alternative concepts will be defined later.
Yet, economies in transition everywhere in the world have learned a lesson the hard way: not everything that is Western - necessarily fits their needs. Many Western techniques, methods, systems and ways of thinking cannot be applied in Macedonia, for instance.

The public sector is a great burden on economies everywhere.

It is mostly financed by collecting taxes from individuals and businesses.

Taxes are re-allocation of economic resources. Taxes are nothing but money transfers from one group of citizens (the taxpayers) to other groups: to those who cannot pay taxes (such as children and the elderly) and to those who would not pay taxes, the tax evaders. Taxes are a penalty paid

by the more productive and honest segments of society. Small wonder that taxes have a bad reputation in the West. They are considered to be both unjust and inefficient.

But taxes are both necessary and inevitable. There is no better way to finance the operations of the government and of the public sector.

The more taxes collected - the heavier the involvement of the state in the economy. This involvement is measured as a percentage of the GDP - the Gross Domestic Product. As we mentioned in our previous article, the figures are frightening: governments consume from 19% (Singapore, Hong-Kong) to 59% (France) of the products and services produced in the economy!

Research shows that public spending of tax money is 6 times less efficient than the same money invested by the private sector. The two sectors: the Private and the Public compete on the same, limited, amount of resources. Every Denar paid to the tax collector is one Denar less invested in the formation of new businesses and one Denar less invested in private consumption.

We can safely state that taxes inhibit economic growth and increase unemployment.

So the current mood in the West is anti big government and anti taxation.

People evade taxes. About 13 - 25% of the total capital in the world is "black" capital, upon which taxes were not paid. It is estimated that Macedonian firms and individuals hold more than 1 billion USD in undeclared cash - against an official figure of 200 million USD in circulation in the whole Macedonian economy.

People openly refuse to pay taxes and they take their governments to court on these issues.

Governments are doing their best to simplify procedures and tax returns (=the forms on which income is reported).

In fiscal theory, we differentiate between progressive and regressive taxes.

A progressive tax is one which is larger - the larger the income is. A millionaire in a progressive tax system will pay much more (as a percentage of his income) than his driver.

A regressive tax is one that totally unrelated to the level of income. Both the millionaire and his driver will pay the same percentage of tax if they buy a car, for instance.

Governments have become desperate. They introduce one rate income tax systems: all incomes are taxed at the same rate, regardless of their size. They are switching from taxes on income (which are socially progressive in nature) to taxes on consumption (such as VAT - Value Added Taxes) which are socially regressive in nature.

The overall goal is commendable: to lower the burden of taxation to less than 20% of the GDP.

But obtaining this goal means that Governments will have to reduce their involvement in the economy and cut back on services and on the public sector.

This is not a very clever idea for economies in transition.

The public sector in economies in transition could and should be privatized only after three conditions have been met:

First, the establishment of a strong private sector- Individuals and firms in the private sectors are the consumers of electricity, water and phone services. Without a strong customer base, it would be very difficult to sell the PTT, the electricity company or the water companies to any private investor in reasonable prices. The public sector must become profitable to be sold to the private sector (=to be privatized). A losing company is not worth anything to an investor, unless he thinks that he can turn it around and make it profitable. The best way to do this is to increase its sales to a loyal and sizeable group of clients.

The second condition: the de-regulation of prices and the abolition of subsidies.

The state must exit forgo all levels of intervention in the finances of the public sector. It must not fix the prices of its products and services and it must not subsidize it. Subsidies and tax incentives thwart and distort the true economic and financial picture. They hinder the proper and correct valuation of the public sector firm by prospective investors.

An investor must feel certain that he will be allowed to fix any price for the goods and services sold by the public sector firm that he is buying. This is the way to profitability and financial health. The government does not need to worry:

If the investor will charge too high a price - his clients will go to his competition.

But what if there is no competition? What if electricity is supplied by only one electricity firm (a monopoly)? Who will the client revert to if the prices that he is charged are much too high?

This, precisely, is the third condition:

The opening of the marketplace to competition, both domestic and foreign-

To cancel all laws, regulations, rules, precedents which inhibit or prohibit competition. To eliminate tariffs, quotas, permits, licenses and controls (barring those which relate to public health and to the protection of the environment).

Why should Macedonia have only one PTT? Why not six providers?

Why not allow anyone to produce electricity and sell it to the electricity company? Why to have only one electricity company?

Subject to the right regulations concerning safety and financial wherewithal - everyone should be allowed to do anything. Economic history shows that competition provides better goods and services at much lower costs.

It also shows that the public sector is a potential hub of inefficiency and sometimes blatant corruption.

"Lean and Mean" is the name of the game in today's economic environment.

The Public sector is fat and sluggish. It has no right to continue to exist.

Even private sector enterprises are "downsizing" (cutting their labor force considerably).

But certain functions can scarcely be transferred to the private sector. These functions are inherently non-profitable and non-profit motivated. They are usually performed by municipal, local and regional authorities.

The municipal (local) and regional part of the public sector has five sources of income at its disposal:

It is empowered to collect taxes from individuals and from businesses - the size of which is normally linked to the (residential or office) space that they occupy.
It is allowed to collect fees and charges which are fixed and relate to the provision of services such as: water supply, sewage, sanitation, posting commercial signs, parking and toll roads).
It is authorized to levy fines on transgressors against municipal rules and regulations. The best known form of this kind of financing is the parking ticket.
Mainly in the USA, local authorities are permitted to sell municipal bonds ("Munis") to the public - through the Stock Exchange - and directly to institutional investors, such as pension funds.
The local authority which issued the bonds pays the bondholders from current income generated by tax revenues and from specific incomes generated to it by specific projects.

An example: a local authority wants to establish a water treatment facility.

It costs 100,000,000 USD. The Authority receives 60,000,000 from the government and sells 40,000,000 USD worth of bonds to the public via the stock exchanges.

Once the facility is built, it begins to supply water to the residents and to businesses. They pay for the water that they consume - and the income from the sale of the water goes to the bondholders. This income covers both the interest payable on the bond (=its coupon) and the money that the bondholders invested in the bonds themselves and which they have to recover.

* Lately, a new fashion is developing in public administration, called devolution.

It is the transfer of parts of the national budget directly to the local authorities or granting them the right to regulate their own fiscal (=tax) systems.

Devolution is a prime example of a mega-trend in human societies: that of the dismantling of Big Government. But this is subject for yet another article.

10.3 Money, dynamics and indeterminacy

As noted in the introduction, overlapping generations economies differ from finite economies in more ways than simply that their competitive equilibria may be inefficient. Three of these further differences are now briefly discussed.

Money

In a standard competitive economy that exists over a finite number of periods, fiat money whose only use is as a store of value would be worthless. This conclusion can be established by a simple backward induction argument. Money is clearly worthless in the final period since it has no further use as a store of value. Seeing that it is worthless in the last period, no consumer would wish to purchase money in the second to last period so that it is also worthless in that period. This argument can be continued backward until the beginning of the economy. Money is therefore worthless unless it is arbitrarily assumed that it must be used as a means of exchange.

This backward induction argument cannot be applied to the infinite overlapping generations economy and the possibility then arises that fiat money may have value. This can be shown most clearly by returning to the Samuelson economy. The inefficiency in that economy arose because consumers have no opportunity for turning their first-period endowment into second-period consumption.

Money provides such a possibility. As first shown by Samuelson (1958), the introduction of money can permit the attainment of Pareto optimality provided that all generations believe money to be valuable and are willing to accept money in exchange for goods.

Dynamics

The analysis to this point has characterised the steady state solutions of the Samuelson economy and investigated the existence and welfare properties of equilibria for the generalised economy. The intention now is to consider the possible dynamics of non-steady state solutions. The dynamics of overlapping generations economies were first investigated by Gale (1973), who provided an example of an economy with two period cycles, and then in detail by Grandmont (1985). The work of Grandmont revealed the potential complexity of the dynamics that can arise.

The structure of dynamics can most easily be seen by considering a slightly modified version of the Samuelson economy. It is now assumed that there is a single consumer in each generation and that an endowment is received in both periods of life. In addition, the preferences of all consumers are identical and can be represented by a utility function that is separable between consumption in the first and second periods of life.

Indeterminacy

A theorem of Debreu (1970) shows that almost all competitive economies of the form described i have a finite number of isolated equilibria so that each equilibrium is locally unique. That a similar conclusion does not apply to overlapping generations economies has been shown by Gale

(1973), Geanakoplos and Polemarchakis (1984) and Kehoe and Levine (1985). For overlapping generations economies robust examples can be constructed that have a continuum of equilibria so that both finiteness and local uniqueness do not apply.

Such indeterminacy imposes considerable problems for analysis. Comparative statics exercises are not possible and the concept of perfect foresight along such indeterminate paths is implausible. The introduction of money compounds the problem by introducing a further dimension to the indeterminacy.

The problem of indeterminacy is inherent in all applications of overlapping generations economies. It is sidestepped in the chapters that follow, as well as in much of the literature, by focusing only upon steady states. As has already been shown, there are just two steady states for the Samuelson economy and in the aggregate production economy discussed next it is possible for there to be a unique steady state.

10.4 Summary

This section has described the overlapping generations economy and has illustrated a number of the important properties that such economies possess. In contrast to standard competitive economies, the equilibria of an overlapping generations economy need not be Pareto optimal, though all are weakly Pareto optimal, and there may be an uncountable infinity of equilibria. Furthermore, fiat money can play a socially useful role in leading to the attainment of a Pareto optimum and, consequently, may be valued.

These features of overlapping generations economies undermine many of the presumptions developed from analysis of standard competitive economies. Due to this, it has proved an important tool in the study of public economics. The version of the overlapping generations economy that will be employed in the following chapters is less general than that described in this section but the results here provide the foundation of the analysis.

10.5 Conclusions

Overlapping generations economies have a number of interesting features that are not shared with standard Arrow-Debreu economies. The competitive equilibria can be inefficient, complex endogenous dynamics can be generated, fiat money may be valuable as a store of value and its existence can raise the level of welfare and indeterminacy in equilibria may exist. In the context of public economics, it is the first of these that is arguably the most important since it provides a role for corrective policies in the absence of any additional market failure.

More importantly, the structure of the economy permits the analysis of the effects of policies that are essentially inter temporal in nature. This will be utilised in the analysis of social security, debt and taxation in. In both cases, the nature of inefficiency in overlapping generations economies and the structure of Golden rules will be central in explaining the results of policy analysis.

CHAPTER 11
Social Security

12.1 Introduction

The provision of social security to provide cover against disability and the inability to work due to old age is a feature of all developed economies. Such programs are large, both in terms of the proportion of population receiving benefits and in terms of the total payments as a proportion of national income. The programs are not without their difficulties. Thompson (1983) describes the adjustments made to the US program following overly optimistic forecasts of real earnings growth. The expected increase in the ratio of retired to employed due to greater life expectancy will also place the system under pressure. There is also evidence, see Kotlikoff (1989), that social security programs are required due to the inadequate savings and insurance purchases of the elderly which would not support them through retirement. These observations show that the analysis of social security and its economic impact is a subject of practical importance.

The first issue in the analysis of social security is its effect upon the equilibrium of the economy and, particularly, upon the level of the capital stock. If a social security program has the form of a forced saving program, so that consumers are provided with greater second period earnings than they would naturally choose, then the program may raise the capital stock. This outcome will be beneficial in an undercapitalized economy. Conversely, if the program simply transfers earnings from those who are working to those who are retired, savings and hence the level of capital may fall. It can be judged from the difference in outcomes of these simple scenarios that the consequence of the existence of social security is closely dependent upon the program's structure. In addition to its effects on savings, the interaction between social security and the retirement decision may also be significant.

A second major issue that arises is the effect of demographic change upon the social security program. Present trends are for the proportion of retired consumers to increase and for the retired to live longer. At a practical level, this raises the question of whether the working population can continue to fund social security. A related, but more theoretical issue is the question of whether

there exists an optimal rate of population growth. This issue arises from the observation that if the rate of population growth increases, there are more workers to support each retired consumer but the level of capital per worker is reduced. This trade-off suggests there may be an optimal growth rate.

The introduction of a social security program results in a transfer of resources towards the generation those benefits on the introduction of the program and away from later generations. This raises the question of how such a program receives the support that is required for it to be introduced at all. The mechanism by which the level of benefits in the program are selected also needs to be addressed. Furthermore, the reasons why the private sector cannot provide insurance cover on terms at least as attractive as those offered by social security must also be addressed.

This chapter begins by setting out the important distinction between fully funded and pay-as-you-go social security. The economic effects of these two polar forms of program are markedly different. An optimal social security program is then characterised under the strong assumptions of certainty and fixed labour supply. A number of extensions of the basic result are considered including an analysis of optimal population growth. Determination of the level of social security by majority voting and various justifications for social security are then considered including altruism, myopia and aggregate uncertainty. The final section analyses the effect of introducing individual uncertainty about the length of life.

11.2 Fully funded and pay-as-you-go

The financing of social security can have important implications for the economic effects of the program and for its sustainability in the face of demographic change. The purpose of this section is to define alternative structures of financing and to broadly sketch their differing effects.

To make the definitions as precise as possible, assume that the economy is one with overlapping generations and that each consumer lives for just two periods. Each consumer supplies labour during their first period of life and is retired in the second period. Finally, there is one capital good available, purchases of which provide a repository for savings.

In a fully-funded system each consumer when young makes contributions towards social security via a social security tax and the contributions are used to purchase capital by the social security program. Total capital in the economy is then given by the sum of private capital and the publicly owned capital of the social security program. Total pension benefits received by a consumer when retired are then equal to their contribution to the program plus interest received. Such a program satisfies the equalities

Pensions = social security tax plus interest = capital plus return.

A fully-funded social security system effectively forces each consumer to save an amount at least equal to the tax they pay. Consumers may, of course, choose to save more. If, in the absence of social security, all consumers chose to save an amount in excess of the taxed levied by the program then, holding all else constant, a fully-funded system will simply replace private saving by an equivalent amount of public saving. If these conditions are met, a fully-funded system will have no effect upon the equilibrium outcome. In more general settings with a variety of investment opportunities, the possibility must be considered that the rate of return on private savings may differ from that on public savings. When it does, a fully-funded system may affect the equilibrium.

In contrast to the fully-funded system, a pay-as-you-go social security program does not own any capital. Instead, a pay-as-you-go system relies on the contributions of the young of each generation to provide the pensions of the old of the previous generation. Such a program therefore satisfies the equality total benefits received by generation $t - 1$ = *contributions of generation t.*

A pay-as-you-go system leads to an intergenerational reallocation of resources whereas a fully-funded system can at most cause an intertemporal reallocation for each generation. From this observation it can be seen immediately that the two systems will have rather different welfare implications, some of which will be investigated in the following sections.

Systems that fall between these two extremes will be termed non-fully funded. Such systems own some of the capital stock but the payments made in a period may be greater than or less than the revenue, composed of tax payments and interest, received in that period. The difference between the two will comprise investment, or disinvestment, in capital.

11.3 An optimal program

The analysis of this section presents Samuelson's (1975a) characterisation of an optimal social security program. The assumptions under which this will be undertaken are strong. In particular, it is assumed that labour supply is completely inelastic and that the date of retirement cannot be varied. The relaxation of these restrictions, and others, in later sections will place the results of this section in context.

Given that the competitive equilibrium may be non-optimal in an overlapping generations economy, there is potentially a role for a social security to enhance efficiency. In fact, in the discussion of Pareto optimality , a simple form of social security program was shown to be Pareto-improving over the competitive outcome. That example involved each young consumer transferring a unit of the good to the old consumer of the previous generation.
This series of transfers, which is essentially a pay-as-you-go social security program, raised the welfare of the generation that were old when the program was introduced and left that of all later generations unaffected. This argument is further formalised in Aaron (1966).

11.4 Some extensions

The optimality result of the previous section was derived under strong assumptions. Foremost amongst these was the inelastic supply of labour. One obvious consequence of the provision of a pension is to encourage retirement and through this mechanism to reduce labour supply. An induced increase in retirement raises the proportion of retired to working consumers and reduces the welfare gains obtained from the implementation of social security. The provision of a pension will also affect the savings decision. There will be an incentive to reduce saving since a pension is simply a substitute for private saving. Conversely, earlier retirement suggests the need

to raise savings to cover the longer retirement period. The resolution of these effects will have important implications for the level of the capital stock. Variable labour supply, and other extensions to the basic analysis, are now considered.

11.4.1 Labour supply and retirement

The interaction between social security provision and the retirement decision has been analysed from both partial equilibrium and general equilibrium perspectives.
Although the important results of the former will be noted, it is the latter that is of primary interest here.

Under the assumptions of perfect capital markets, actuarial fairness and known lifespan, Kotlikoff (1979) shows that the provision of social security will not affect the retirement decision. This is simply a result of pensions being equivalent to private savings in that the provision of pensions does not alter the opportunity set of a consumer. An increase in pension simply replaces private savings on a one-for-one basis. Relaxing each assumption in turn, Crawford and Lilien (1981) show that the effect on the date of retirement is in general ambiguous but a progressive system tends to advance retirement for low-income workers. Diamond and Mirrlees (1986) focus on the problems raised by the government's inability to distinguish those unable to work and those who choose not to work. When consumers are forced to retire due to an inability to work, but with no prior warning of this, it is shown that the optimal social security program will have benefits rising with the age of retirement.

Although suggestive, these analyses do not address the interaction between the retirement decision and the equilibrium of the economy. There are clearly important connections between these since early retirement reduces labour supply while reduced savings lower the equilibrium capital stock.

11.4.2 Effect on savings and capital

With a pay-as-you-go social security program in operation, any effect that the existence of the program has upon private savings is reflected directly in the level of the capital stock since, by definition, the program owns no capital. Social security has two conflicting effects upon the level of private saving. The first effect is the substitution of social security for private savings which naturally reduces the level of saving. Offsetting this effect is the likelihood that social security will bring forward retirement. If this does occur, private saving should rise in order to cover the increased length of retirement. At this level of generality, the net effect is indeterminate.

In contrast to the earlier evidence of Cagan (1965) and Katona (1964) which showed that consumers covered by private pensions did not save less than those not covered, Feldstein (1974) estimated that the existence of the US social security program reduced private savings by 30-50%. This evidence was based on the estimation of a consumption function that included social security wealth as one of the explanatory variables. The central estimate suggested that, during the 1960's, the capital stock was 38% lower with the social security program than it would have been without. Although widely cited, these results have not always been replicated in later studies. Danziger, Haveman and Plotnick (1981) suggest that the true figure should be somewhere in the range of 0-20% whilst
Aaron (1982) concludes that there is simply a lack of agreement amongst the studies. As an example of conflicting findings, work by Lee and Chao (1988) estimates labour force participation and personal savings simultaneously taking into account private pensions. Although social security wealth is found to encourage retirement, the payment of contributions to social security has an insignificant effect on private savings.

Whether it is possible for a theoretical economy to exhibit a similar responsiveness to the introduction of social security as that suggested by Feldstein has been investigated by Kotlikoff (1979) in an analysis involving a continuous-time formulation of endogenous retirement. Consider an economy of identical individuals with has a population growth rate of n and endogenous labour-augmenting technical progress at rate g. The latter assumption implies that the wage rate is also growing at rate g. At each point in time, the fraction of the existing population that has lived out their lifespan of D years will be replaced by new consumers. Each

consumer chooses their consumption stream and date of retirement to maximize discounted utility.

11.4.3 Ricardian equivalence

Ricardian equivalence originally referred to the proposition that the method of financing government expenditure, whether through taxes or borrowing was irrelevant. To illustrate this, consider the following example. To reduce the level of taxation by *D* in period *t*, the government sells quantity D of bonds. To repay the bonds the following period, the government must levy additional taxes in $t + 1$ of $[1 + r] D$. Since the discounted value of this increase in taxation is exactly equal to the value of the original tax cut, the net wealth of the economy is unchanged when viewed from period t. The bond-financed plan is therefore equivalent to keeping the initial level of taxation unchanged, illustrating the principle of Ricardian equivalence.

Ricardian equivalence needs to be made here in order to relate the argument to the analysis of social security. Returning to the example above, it would seem that if some of the households alive at time t were no longer alive at $t+1$ then the equivalence would fail since they would benefit from the reduced tax payment but would avoid the increased tax. To make this point stronger, assume the bonds mature N periods after issue. The argument of the example would still apply if the population remained unchanged over the N period but it now seems less reasonable to expect this.

There is, as first noted by Barro (1974), a mechanism that will maintain equivalence even if the population changes between issue and redemption of bonds. Suppose that each consumer has a single identified descendent and that they care about their own level of consumption and about the utility level of their descendent. Such intergenerational altruism then links finitely-lived consumers into a household whose lifespan is as long as that of the economy. The altruism will manifest itself in consumers choosing to leave bequests to their descendants and it is via the bequest motive that Ricardian equivalence arises. To see this point, assume that the bonds are purchased by generation t but the tax liability is borne by generation t+1. If generation t raises its bequest to t+1 by exactly

the amount necessary for t + 1 to meet their increased tax liability then the consumption plans of both generations will remain unaffected by the switch from tax-finance to bonds thus maintaining the equivalence result.

One implication of Ricardian equivalence has, in fact already been described. The discussion of a fully-funded social security program noted that such a program would leave the equilibrium of the economy unaffected. The fully-funded system requires that the pensions received by each generation are equal to the taxes that they paid. In this case an increase in tax when young is accompanied by the receipt of a pension when old which is equal in value to the tax plus interest. This is simply the opposite of the initial example of equivalence and a slight modification of that argument shows why it has no net effect. The households reduce their private savings by the amount of the tax, maintain their consumption levels and replace private saving by saving in the pension plan. Since private and public savings have the same return, they are indifferent to this rearrangement. It is worth noting that this argument presumes that private savings are initially greater than the tax used to finance the pension. If they are not, then equivalence will not apply.

Introducing intergenerational altruism allows the equivalence argument to be extended to pay-as-you-go social security. A pay-as-you-go system can be interpreted as a forced transfer from the young generation to the old. If all members of the old generation were making a positive bequest to their descendants prior to the introduction of the program, the effects of the program can be entirely neutralised by the old simply increasing their bequest by exactly the pension they receive. By the definition of a pay-as-you-go system, this increased bequest will exactly match the taxes paid by the young. Therefore, with intergenerational altruism, pay-as-you-go social security will have no effect upon the equilibrium provided the bequest motive is operational prior to the commencement of the program.

11.5 Lifetime uncertainty

The distinguishing feature of uncertainty about the length of life is that it constitutes individual, rather than aggregate, risk. Since the risk is individual, information about the nature of the risk

may be held by the individual and be unobservable to the government. Furthermore, individuals may take unobservable actions that affect the nature of the risk. Each of these aspects of individual risk leads to a position of asymmetric information between agents in the economy which can result in the failure of markets to achieve a Pareto efficient outcome. Such failure provides a further motivation for the introduction of social security.

Consider an economy in which each consumer lives with certainty for one period but with some positive probability less than 1 may die before they enter their second period of life. The payment of tax towards a social security program can then be viewed as the purchase of an annuity which has a return equal to the pension if the consumer survives into the second period and a return of zero if they do not. The analysis of Sheshinski and Weiss (1981), which is described in more detail below, introduced this perspective of social security and showed how the introduction of such annuities with an actuarially fair return, where none previously existed, could raise welfare.

If all information were public, there is clearly no reason why such annuities could not be provided privately at actuarially fair rates of return. If they were, the introduction of a social security program with the same structure of returns would have no effect on welfare. To avoid this conclusion, Sheshinski and Weiss (1981) rule out such private annuities while Karni and Zilcha (1986) allow private annuities but assume that they can only be provided at actuarially unfair rates for reasons of resource cost in provision. The individual nature of lifetime uncertainty however provides sufficient reasons for not expecting actuarially fair private annuities to be available. If the probability of not surviving into the second period of life differs between consumers and is private information, then the problem of adverse selection may arise. That is, an annuity designed for those who have a low probability of survival will also appeal to those with a high probability. Hence any actuarially fair annuity will entail a loss for its supplier. If individuals can take actions that affect the probability of survival which cannot be observed by the suppliers of annuities then moral hazard will lead to no actuarially fair annuities being offered.

The basic model of uncertain lifetime and the annuity approach to social security are now described. This is followed by an analysis of the consequences of adverse selection and moral hazard for economies with both private annuities and social security.

CHAPTER 12
Debt and Taxes

12.1 Introduction

In the policy analyses of previous chapters it was invariably assumed that the government revenue requirement was pre-determined and the policy instruments were chosen to maximize welfare given this fixed requirement. The satisfaction of the revenue constraint implicitly prevented the government issuing any debt. In a static setting there is some sense in this procedure since, by its very nature, the static setting prevents a comprehensive analysis of the effects of the borrowing and repayment process. Introducing time and considering the intertemporal maximization of welfare permits the indigenization of government debt and allows the determination of its optimal level to become part of the overall policy formulation process. It also allows the interaction between debt and taxation to be explored. The employment of both debt and taxation as instruments of government policy will affect the capital market of the economy and, through this, the dynamic evolution of the economy and the eventual steady state.

It should be noted that the policy optimisation problems studied in this chapter are complicated by the infinite time span of the economy. This leads to the maximisation being subject to the infinite set of constraints which describe the evolution of the economy. Two ways of characterising the solutions to such problems are illustrated. The first is based upon the methodology of dynamic programming; in particular the principle of optimality. The second approach reduces the dimensionality of the problem by assuming that the chosen allocations achieve Pareto optimality between generations. This provides a shadow interest rate with which future variables can be discounted.

12.2 The effect of debt

The effect of national debt has long been a contentious issue, with the debate stretching back to at least Ricardo (1817). It is also a subject at the heart of policy analysis since the issuing of debt

is an important practical policy tool. The conservative perspective upon debt is that it can only be harmful to welfare and that governments should do all they can to minimize borrowing.
Alternatively, the philosophy of Keynesianism is that debt is simply another tool of policy and should be employed whenever advantageous. To assess these competing viewpoints, it is clear that a dynamic economy must be analysed as its effects are felt through its issuing, servicing and redemption. The existence of debt instruments as an alternative to investment in physical capital as a means of saving for consumers alters the relationship between the level of savings and available capital for the following period. In fact, capital accumulation must be less for any given level of private saving. The taxes required to service debt also have an effect upon the behaviour of consumers and the equilibrium of the economy. Given these observations, the question remains as to whether debt is always harmful to welfare. This section will determine both the positive effects of debt on the long-run equilibrium of the economy and its welfare effects. This is undertaken for both internal and external debt.

For any person, debt is like this illness that never goes away, it persists and persists, never truly getting better until action is taken. The comparison works because like an illness, debt can cause a great deal of suffering and pain to those who have trouble paying their bills each more, or at all. Immunity against debt is non-existent, everyone is susceptible. Debt can go beyond simply the inability to pay bills on time; it can literally cause both physical and mental health problems.

Otherwise, honest people who are in debt have resorted to stealing, cheating, and lying in efforts to hide or eliminate their debt. The feelings it causes, it is enough to drive anyone insane. Those suffering from debit will likely feel a combination of shame, depression, embarrassment, anger, and anxiety. While physical and emotional problems occur out of massive debt, other negative side effects occur as well.

They include:

Bankruptcy

Although unfortunate, thousands of people daily need to file bankruptcy, seeking protection under the law. There are three types of bankruptcy, Chapter 7, Chapter 11, and chapter 13. Though it can be a long, drawn-out, and trying process, sometimes bankruptcy can actually help someone in debt get the relief and start they need to come out of debt once and for all.

Eviction

A person in debt may face eviction from their home because they have the inability to pay rent on time each month. Renters who do not pay rent each month will likely find themselves in a situation in which the property owner needs to evict them.

Wage Garnishment

To add to the lack of available money each month, creditors may sue and seek a judgment to have your wages garnished. Essentially, the judge has given your employer an order to make the payment directly out of your paycheck to the creditor you owe. This is money you will never even see, because it comes out instantly.

Foreclosure

Just as if you had trouble paying rent, if you have trouble paying the mortgage, foreclosure is a real possibility. The trouble with foreclosure is that you lose your home. This is one of the most common problems faced for those with bad debt.

Emotional Troubles

Even the happiest of people can find the pressure and embarrassment of debt too much to handle. The press is relentless, it starts with mail and telephone calls from creditors at all hours of the day or night, then it can lead to losing their possessions, such as their car, apartments, or homes.

Suicidal Tendencies

It is a very sad fact that sometimes those suffering from intense debt commit suicide because debt has caused this so many troubles in their lives. Their inability to eliminate their debt drives them to thinking suicide is the only way out.

As you can see, debt can have a real impact on a person's life. The negative effects doesn't stop there either, debt will remain on the credit rating of the person for at least seven years. Debt comes at an extremely high emotional and financial cost.

Debt starts out as a good thing, allowing us to live the life we may not otherwise be able to live. However, in some cases, it has the ability to take control and negatively influence your life.

The analysis is set in the Diamond economy, with a fixed labour supply, and a diagrammatic framework is employed that simplifies the derivation of results.

12.2.1 External and internal debt

The starting point of the analysis is to distinguish between internal and external debt. This is necessary since they have distinctly different effects upon the stationary equilibrium and the welfare level of consumers.

External debt is debt owed to agents located abroad, that is the holders of the debt are not resident in the economy that issued the debt. On such debt there is an interest charge that must be paid each period and this must be financed by either further borrowing or by taxation. The important features of such debt are that it is not in competition with physical capital as a savings instrument for the consumers of the issuing economy but its servicing and repayment leads to a flow of resources out of the economy.

In contrast, internal debt is held by residents of the economy in which it is issued. With internal debt the government borrows off its own citizens by providing bonds which compete with

private capital. Private savings are divided between the two investment instruments. When there is no uncertainty bonds and capital will be perfect substitutes, so in equilibrium they must pay the same rate of return. The cost of financing internal debt is again met by either further borrowing or by taxation. In contrast to external debt, internal debt does not lead to any resources being transferred away from the economy that issues the debt.

12.2.2 Effects of debt

The analysis now considers the real effect upon the steady state equilibrium, and the utility level of each consumer, of internal and external debt, starting with external debt. The analytical technique employed, as in Diamond (1965), is to characterise the steady state of the economy as the simultaneous solution to a pair of equations for a fixed stock of debt. The consequence of a change in the level of debt can then be found by determining its effect upon the graphs of these equations.

External Debt

It has already been noted that the analysis is conducted for a fixed stock of debt. Before it can be undertaken, it is first necessary to clarify the sense in which the level of debt is fixed since alternative interpretations are possible. If the stock of debt were fixed in absolute terms, it would eventually have no effect upon the economy as population growth took place and the level of debt per capita became asymptotically zero. Therefore, rather than fix the absolute stock of debt, it is assumed that the level of debt per young consumer remains constant and the effect of changes in this ratio are analysed.

Internal Debt

In the case of internal debt, the issue of debt results in the government borrowing from its own citizens. This leads to competition between government debt and physical capital for consumer savings. Internal debt therefore affects the economy through both the taxes required to service the debt and through its effect on the capital market.

12.3 Optimisation of debt and lump-sum taxes

In a static economy with identical consumers, the only role that lump-sum taxation can have is to collect revenue (and, of course, it is the most efficient method of revenue collection). Other than this, there is no role for it to play in raising efficiency or welfare. The same cannot be said in an overlapping generations context since the potential inefficiency of the competitive equilibrium opens up additional avenues by which lump-sum taxation can affect welfare. By varying the timing of taxation over the life-cycle it is possible for lump-sum taxes to affect the savings decisions of consumers and, through this mechanism, the level of the capital stock. This affects the inter temporal evolution of the economy. The employment of lump-sum taxation also makes it possible for the government to achieve intergenerational transfers of income. These observations makes the study of the design of lump-sum taxes a worthwhile exercise.

12.4 Summary

This section has detailed the connections between lump-sum tax policy and debt policy and has shown the equivalence of unrestricted lump-sum tax policies to combinations of debt and restricted lump-sum taxes. Combined with the analysis of optimal lump-sum taxes, these results show how the modified Golden rule equilibrium can be sustained by a number of combinations of policy instruments.

In assessing these results, it should be borne in mind that the economy under consideration was restricted by the assumption of an homogeneous population. This limits the scope for the worthwhile differentiation of lump-sum taxes, since consumers are only distinguished by their date of birth, and therefore makes feasible a policy that achieves the optimal outcome. If there were further degrees of differentiation of the consumers, for example by endowment of labour, then lump-sum taxes could be differentiated across the lifecycle and over the endowment. A debt policy and a uniform lump-sum tax policy would then not be equivalent to the optimal fully-differentiated set of lump-sum taxes. There would then be less justification for expecting the optimum to be achievable since this would also require intergenerational redistribution which

could not be fully undertaken with uniform lump-sum taxes. However, as shown by Park (1991), the modified Golden rule will be satisfied by the correct choice of uniform lumpsum taxes and debt policy even with a heterogeneous population but other taxes will be required to supplement them in order to achieve intra generational distributional aims. Since, in practice, populations are not homogeneous, this observation justifies the study of policies that are not equivalent to the set of optimal lump-sum taxes.

12.5 Debt neutrality

The concept of debt neutrality, or Ricardian equivalence, can be traced back to Ricardo (1817).In this section the emphasis will be upon proving the basic neutrality result and exploring its limitations. The essence of debt neutrality is that the real economy is unaffected by whether the government chooses to raise revenue by using taxation or through the issue of debt. Although the payment of taxes clearly reduces wealth, the issue of debt would seem to leave the wealth of consumers intact since it simply displaces private capital from the portfolios of consumers. However, this overlooks the fact that the issue of debt implies future tax liabilities for its servicing and redemption. Discounted back to the present, these future liabilities reduce the present value of wealth by precisely the same amount as the tax payment. Since wealth is identical in both cases, so must the equilibrium outcome. This simple argument is the foundation of the theory of debt neutrality.

12.6 Generalisations

Blanchard (1985) has considered the possibility that the lifespan of each consumer may be of random length. The introduction of such uncertainty has the implication that those who benefit from any debt issue will have a probability of less than one of being alive to face any future tax payments. In the analysis of Blanchard each consumer has a constant probability of their life continuing (which gives rise to the description of such an economy as embodying perpetual youth) and the population remains constant as new consumers are born at each point in time to replace those who have died. To prevent unintended bequests, a life insurance market offering insurance at fair terms is assumed to be operational. When there is no bequest motive, neutrality

does not hold in such an economy. This analysis is extended by Buiter (1988) to show that a necessary and sufficient condition for debt neutrality to apply in such an economy is that the sum of the probability of death and the growth rate of population is identically zero. This is clearly violated in the Blanchard analysis except when the consumers have a zero probability of death and are therefore infinitely lived.

Although the focus to this point has been upon debt neutrality, an economy with an operative gift or bequest motive is capable of neutralising a broad range of fiscal policies. Since Bernheim and Bagwell (1988) show that almost any policy can be neutralised, the fact that this seems refuted by practice suggests that the economy in which such propositions can be derived is not a successful representation of reality. To attempt to achieve debt neutrality without the neutrality of all policy, Abel and Bernheim (1991) note that changes in the level of debt are often neutralised by exploiting only a few links in the intergenerational chain whereas the neutralisation of other policies requires the exploitation of many links. This observation motivates the introduction of friction into the intergenerational altruism via the derivation of utility from the act of giving, imperfect knowledge of the later generation's preferences and social norms that govern bequests. The first two allow approximate neutrality in the short run but drive the marginal propensity to consume to zero. The third avoids this conclusion but does lead to the conclusion that an exogenous increase in wealth of any one consumer can never be a Pareto improvement. Due to these unpalatable conclusions, the introduction of friction in this way cannot be claimed to be a successful mechanism for retaining debt neutrality whilst eliminating more general neutralities.

Finally, it should be noted again that debt neutrality fails if the gift or bequest motives are not operative. In addition, it can also fail when the change in policy leads to redistribution between consumers with differing marginal propensities to consume. This did not occur in the theorems above since all consumers were identical and the policy affected each equally. It can also occur when lifetimes are uncertain and insurance markets are imperfect (Abel (1986)) and when the tax instruments are not lump-sum. As yet, neither empirical evidence (see Bernheim (1987) and Sweeney (1988)) nor experimental evidence (Cadsby and Frank (1991)) has confirmed or refuted whether neutrality applies in practice.

12.7 Conclusions

The analysis of tax policy in dynamic economies involves consideration of both intra generational and inter temporal allocations. Compared with the static analysis, there is also a broader range of instruments available since the use of debt becomes a meaningful option. This chapter has attempted to capture these issues and to illustrate alternative methods of analysis. The effects of debt were demonstrated in an economy without intergenerational altruism. Although an increase in external debt can rarely lead to an increase in welfare, in an over capitalized economy an increase in internal debt will. The policy relevance of this finding has to be considered in the light of the Ricardian equivalence proposition that changes in debt have no real effect upon the economy. A proof of this proposition was given but it was also argued that it required a particular form of intergenerational altruism and that there were numerous circumstances in which equivalence does not apply.

In dynamically efficient economies with a homogeneous population, the introduction of an income tax or an interest tax simply adds a distortion and reduces welfare. With a heterogeneous population intra generational distribution also becomes relevant. Despite this, an interest tax is redundant when the utility function is separable and the optimal nonlinear income tax is employed.

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